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WAR MACHINE

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A fully illustrated guide to Modern Infantry Support Weapons

WAR MACHINE

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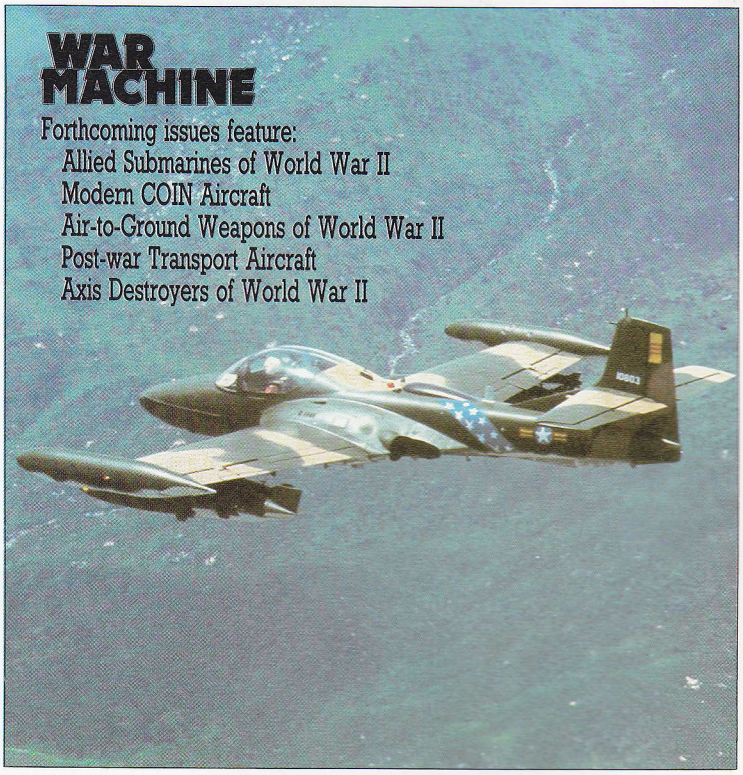

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Modern Infantry Support Weapons

Modern infantry units have more integral firepower than ever before: since 1945 mortars have been built in every size, from hand-held models to monsters weighing over a ton. Rifle grenades are being developed into devastating close-combat weapons, and even anti-tank systems are being introduced to infantry firefights.

A British Army 81-mm (3.19-in) L16 mortar operates under full NBC conditions. Modern infantry may well have to remain in action during future chemical warfare attacks, and have to learn how to use their weapons even when wearing a full NBC suit and respirator. Under such conditions combat efficiency is always impaired.

The combat power of the modern infantry has now reached the point where a single infantry company can go into battle with much of its own supporting firepower, which in its turn far outweighs the equivalent firepower of a World War II infantry battalion. Today the company usually has its own mortar fire support and at battalion level there is more potential mortar support. Many infantry divisions now use large-calibre mortars to lay down their own equivalent of artillery fire support, to the extent that most infantry formations are now virtually self-sufficient in this respect. This support also works downward as well as up, for the modern foot soldier is a walking arsenal of personal fire support. The introduction of the miniature grenade and its family of launchers means that the infantryman can cover the area extending outward from the range of the hand-thrown grenade to the minimum range of company or platoon mortars. Within this circle almost any target singled out for fire suppression or demolition can be tackled directly by the individual infantryman without having to call upon heavier weapons held at higher command levels.

The mainstay of these locally-controlled support weapons is still the mortar in all its many forms, including the automatic weapons such as the little-known Soviet Vasilek. The mortar is still the ideal infantry support weapon as it is small, light and accurate. But this has not prevented the development of new types of weapon, including multiple grenade-launchers such as the Italian AP/AV700, and such direct-fire weapons as the Israeli B-300. In age terms the Carl Gustav recoilless gun is now considered to be rather elderly, but it is still a valued weapon in many armies, although in destructive effect is is now outclassed by such innovations as the RAW (Rifleman's Assault Weapon) with its combination of light weight and large warhead. In many ways the RAW, which is still in its development infancy, could well indicate the future path of infantry support weapons: relatively short-range, direct-fire weapons of considerable power that can be carried and used by one man under on-the-spot control. This will still leave a role for the longer-range mortar, for there are no signs that this will leave the tactical scene; indeed, there are indications that it will assume an even more important tactical role as years go by.

A US mortar team is seen in action during the Vietnam War. Close-range infantry battles in South East Asia proved the value of infantry support weapons in providing quick response fire, and have led to the US M224 light mortar programme and to development of the M203 grenade-launcher.

AUSTRIA

Austrian mortars

The crew of a Noricum 81-mm (3.19-in) mortar prepare the weapon for firing. Manufactured by the Vereinigte company, successors to the 400-year-old tradition of the Bohler company, this piece was first introduced as the 81-mm Type M8/112 VEW mortar.

The Austrian company Südsteirische Metallindustrie GmbH (SMI) is a relative newcomer to the armaments business, but has made a considerable impact by its ability to design and develop weapons of remarkable performance using the resources of its associated metal-producing facilities, which are capable of supplying special steels and other alloys. Mortars are but one aspect of SMI's weapon activities, but the company currently produces some very advanced designs in this category.

Smallest in calibre of these mortars is the 60-mm (2.36-in) **SMI M6** range. There are three mortars in the range: the **M6/214 Standard**, the **M6/314 Long Range** and the **M6/530 Light**. Of the three the M6/214 is the most orthodox, while the M6/314 is much longer in the barrel. The M6/530 Light, also known as the **Commando**, uses a lightweight barrel with no bipod and only a small baseplate; it is intended for one-man use and may be fitted with a trigger mechanism. All three mortars can fire virtually any 60-mm mortar bomb, but SMI produces its own bomb, the HE-80. This weighs 1.6 kg (3.527 lb) and when fired from the M6/314 Long Range can reach a respectable 4200 m (4,593 yards).

Next in line in the calibre range is the 81.4-mm (3.2-in) **SMI M8**. The design of this mortar is influenced by the British 81-mm mortar, but much use has been made of aluminium alloys (for the base plate) and high-quality steels for the barrel. Again there are two models, the **M8/122 Standard** and the **M8/222 Long Range**, the latter having a longer barrel and also weighing more. As with the smaller-calibre mortars it is intended that best results should come from the use of a special bomb, in this case the HE-70 that can be fired to a range of 6500 m (7,108 yards) when fired from the M8/222 Long Range. These mortars have been developed to replace the British 81-mm mortars in service with the Austrian army, but in case that does not happen for a while SMI is marketing the M8 series for the export market, and an 82-mm (3.23-in) variant is offered for use with Warsaw Pact ammunition.

Largest of the mortars is the 120-mm (4.72-in) **SMI M12**, which was designed for the Austrian army but again is being offered for export. The design is based on that of the Soviet Model 1938, as with so many similar mortars in this category, but much use has been made of special metals both to lighten the weight and to enable larger charges to be fired for increased range. The M12 is relatively easy to use in action as a result of a special bipod design with recoil absorbers. Once again a special bomb is produced. This is the HE-78, which weighs 14.5 kg (31.97 lb) including 2.2 kg (4.85 lb) of explosive payload. This cast-iron bodied bomb can be fired to a range of 8500 m (9,295 yards).

Specification

M6/314
Calibre: 60 mm (2.36 in)
Length: 1.082 m (42.6 in)
Weights: mortar 18.3 kg (40.34 lb); bomb 1.6 kg (3.527 lb)
Maximum range: 4200 m (4,593 yards)

M8/222
Calibre: 81.4 mm (3.2 in)
Length: 1.48 m (58.27 in)
Weights: mortar 39.35 kg (86.75 lb); bomb 4.15 kg (9.15 lb)
Maximum range: 6500 m (7,108 yards)

M12
Calibre: 120 mm (4.72 in)
Length: 2.015 m (79.33 in)
Weights: mortar 305 kg (672.4 lb); bomb 14.5 kg (31.97 lb)
Maximum range: 8500 m (9,295 yards)

UK

51-mm mortar

The British **51-mm mortar** was developed to replace the venerable 2-in mortar that originated before World War II. Design work on the new weapon started well over a decade ago, and was undertaken mainly by the Royal Armament Research and Development Establishment (RARDE) at Fort Halstead in Kent. For much of its early development life the 51-mm (2-in) mortar had a monopod supporting leg, but this was eventually discarded as being unnecessary.

The 51-mm mortar is now entering production for the British army, which will use it at platoon level. In its production form the weapon outwardly resembles one of the many commando-type mortars in use elsewhere, but it is a bit more complex than that. It does consist mainly of a barrel and baseplate but the design detail is quite involved. The mortar uses a lanyard-operated trigger mechanism, and aiming is assisted by a complex sight with a built-in Trilux illuminating source for use at night. This mortar has been designed for really close-range operations at ranges as close as 50 m (55 yards). This is achieved by the use of a short-range insert (SRI) normally carried inside the barrel fitted to the muzzle cap: in use the SRI is inserted in the base of the barrel and acts as a firing pin extension while at the same time allowing propulsion gases to expand around the SRI to produce lower barrel pressures and thus decrease muzzle velocity and range. The normal minimum range is 150 m (164 yards), while the maximum is 800 m (875 yards). The mortar can be carried by one man using a webbing sling, and in action a webbing gaiter around the barrel is gripped to aim and steady the barrel. Ammunition is carried in a canvas satchel and a webbing satchel, and a webbing wallet is used to carry cleaning rods and a few ancillaries.

The ammunition for this mortar includes HE, illuminating and smoke. The HE bomb contains a wall liner of pre-notched wire for anti-personnel use. One detail design point is that the bombs cannot be double-loaded in the heat of action: if they are the second bomb protrudes from the muzzle. The HE bomb is stated to be capable of producing a lethal area five times the size of that produced by the old 2-in mortar bombs, as a result mainly of the pre-notched wire fragments.

One of the primary uses of the 51-mm mortar in the British army will be to produce illumination for Milan anti-tank missile teams to attack night targets. The smoke bomb will provide screening for all manner of infantry operations, while the HE bombs will be used in the time-honoured manner. The basic man-carried satchel contains five bombs and one man can carry the mortar and a satchel without impeding his normal combat load-carrying ability to any marked extent. No doubt other members of the section will carry extra ammunition satchels.

Specification

51-mm mortar
Calibre: 51 mm (2 in)
Length: overall 0.75 m (29.53 in)
Weights: mortar 6.28 kg (13.84 lb); HE bomb 0.92 kg (2.03 lb); illuminating bomb 0.8 kg (1.76 lb); smoke bomb 0.9 kg (1.98 lb)
Ranges: maximum 800 m (875 yards); minimum 50 m (55 yards)

A soldier loads a bomb into a 51-mm (2-in) mortar, soon to enter service with the British Army. It will be used as a squad weapon to fire HE and illuminating bombs as well as smoke.

UK

Mortar L16

The British **Mortar L16** has been one of the major success stories of the post-war export scene, for it is used not only by the British army but many other nations as well. It has even managed to break through the US Army sales barrier, and is now in production for the US Army under the designation **M252**.

One of the main reasons for the success of the 81.4-mm (3.2-in) L16 mortar has been its ability to fire bombs using powerful propellant charges that would normally make the barrel too hot for sustained use. The barrel of the L16 is much thicker than normal and is equipped with cooling fins around the bottom sector. These factors combined allow the L16 to fire really 'hot' charges that can provide the weapon with some remarkable ranges: it is now possible to fire some types of bomb to ranges of over 6000 m (6,560 yards). This compares very well with other mortars in service. However, this performance has compensatory disadvantages, and one of these is a level of muzzle blast so high that it can cause acute crew discomfort. In time the present unadorned muzzle of the L16 may be fitted with some form of cone device to divert some of this blast upwards and away from the crew.

Other features of the L16 are no less advanced than the barrel. The mounting is of a type known as a 'K-mount' from its shape: this is arranged to allow rapid and easy levelling and elevation. The baseplate is a Canadian design (as is the sight unit) and is manufactured by a special process whereby the aluminium alloy used is blown into its forming mould by a controlled explosion. The baseplate can also accommodate the American M29 81-mm mortar barrel, and allows 360° traverse without the need to uproot the base plate and replace it at the new angle.

The ammunition used with the L16 can be quite varied, for the weapon can fire any 81-mm bomb in service with NATO. As always, best results are obtained with matching ammunition and the latest HE bomb is the L36A2 with a maximum range of 5650 m (6,179 yards) and a firing weight of 4.2 kg (9.26 lb). This bomb forms a very large number of fragments on detonation. Other bombs include a smoke bomb and a short-range practice bomb. The illuminating bomb normally used is a Brandt design.

The L16 has been well tried in service and has seen combat during the Falklands war, where it was so effective that there were reports from Argentina that the L16 bombs were fitted with heat-seeking warheads that could guide themselves onto human bodies. A special mounting for use on armoured personnel carriers such as the FV 432 or M113 series has been developed, but for normal infantry use the L16 is broken down into a number of loads that can be manpacked into action. Development, especially in the ammunition field, is still continuing and it seems certain that the L16 will remain in widespread service for many years to come.

Specification

L16

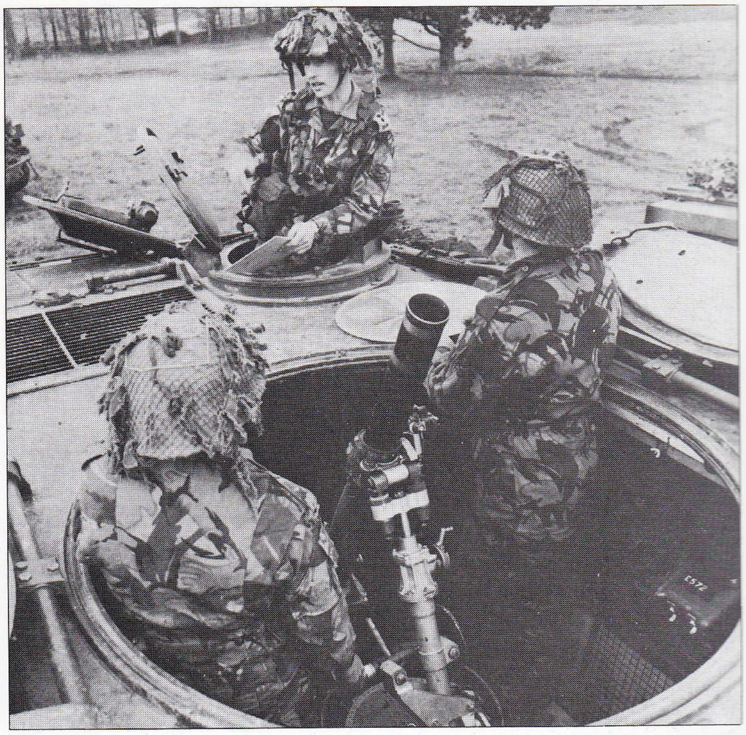
Calibre: 81.4 m (3.2 in)

Length: barrel 1.28 m (50.4 in)

Weights: mortar 37.85 kg (83.45 lb); HE bomb 4.2 kg (9.26 lb); smoke bomb 4.5 kg (9.92 lb)

Maximum range: HE 5650 m (6,179 yards)

The Pacific Island campaigns of World War II proved that mortars were most effective in jungle warfare, and they have remained so ever since. This British L16 mortar team formed part of the ANZUK force based in Singapore in the early 1970s.

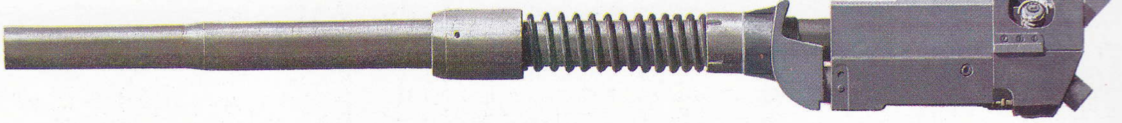


A British Army 81-mm (3.19 in) L16 mortar team have their mortar mounted in a FV 432 armoured personnel carrier. The interior of the carrier is used to stow the ammunition, and the mortar rests on a large and heavy mounting bracket for firing through the roof hatch.

FRANCE

Brandt gun-mortars

With its gun-mortars Brandt Armements has produced a type of weapon that has no real counterpart anywhere, for it has managed to combine the attributes of the conventional gun and the high-angle mortar. The idea is to provide a versatile close-support weapon for use by a variety of ground forces, and basically the idea is simple: a breech-loaded mortar is so arranged that the mortar bombs can be fed into the barrel from the breech for low trajectory firing and from the muzzle for high angle use. This type of weapon was developed initially for mounting on light armoured vehicles, but other applications have been evolved. It cannot be used from a bipod or other



60-CC
1B1/4
AMC

The Brandt 60-mm Model LR long-range gun-mortar is a cross between the smooth-bored mortar and a gun. It can be loaded and fired from the muzzle and can also be breech-loaded from within a vehicle turret. This weapon can fire a special mortar bomb to a range of 5000 m (5468 yards).

ground mounting.

There are two calibres in the **Brandt gun-mortar** range, 60 mm (2.36 in) and 81.4 mm (3.2 in). Of the two the 60-mm version is the one more likely to be used for infantry support as the 81-mm version is deployed more as a main weapon on large armoured cars and armoured personnel carriers. (The 60-mm versions are also used as turret weapons on light armoured vehicles, and some have been mounted on light patrol craft, including inflatable Zodiac-type boats.) These turret mountings are designed for the close support of infantry operations. The smooth-bore barrel is mounted in such a manner that a spring around the barrel absorbs most of the recoil forces, this reducing the trunnion forces to a great degree. Conventional mortar projectiles can be fired, but for direct-fire use special canister rounds (packed with small steel or lead spheres for anti-personnel use at close ranges) or hollow-charge armour-piercing projectiles can be fired. When fired in the low trajectory, the standard 60-mm gun-mortar has a range of about 500 m (547 yards), but when used as a conventional mortar the range is 2050 m (2,242 yards). When the weapon is employed in the mortar role bombs are introduced into the muzzle in the normal way and fall to strike a fixed firing pin; in the low trajectory role a normal breech mechanism is used. Brandt also produced a special long-range version of the 60-mm gun-mortar, but on this model the direct-fire range remains 500 m (547 yards); only in the mortar role is there any range increase, in this instance to 5000 m (5,468 yards) with a special long-range bomb and charge.

On the 81-mm gun-mortar things are more complex. This weapon is intended as main weapon for armoured vehicles, and is thus equipped with a recoil mechanism and is proportionally much heavier than the 60-mm models. But the larger gun-mortar can fire the entire range of 81-mm projectiles, and even has one that is unique to its type. This is an armour-piercing 'arrow' projectile that is fired (using a special charge) only in the direct-fire role. It is capable of piercing up to 50 mm (1.97 in) of armour at 1000 m (1,094 yards), but this is achieved by using a special propelling charge and the weapon is really outside the normal run of infantry support weapons. Development of both the 60-mm and 81-mm gun-mortars is still continuing, and both types are in widespread service. In South Africa the 60-mm gun-mortar mounted on the Eland armoured car makes much use of the canister round as an anti-ambush weapon during bush warfare.

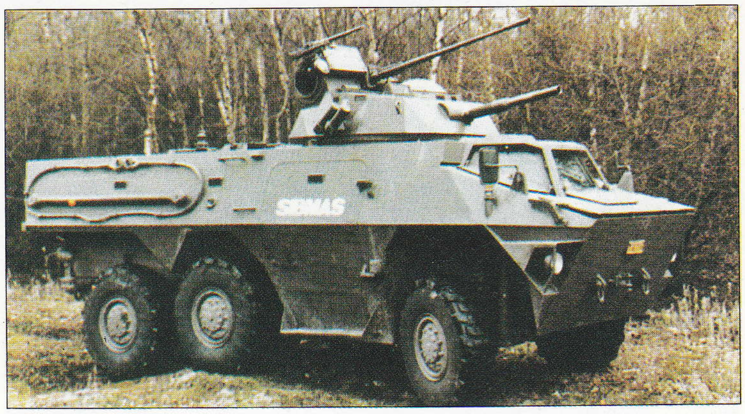
Specification

60-mm (standard model)
Calibre: 60 mm (2.36 in)
Length: 1.21 m (47.64 in)
Weights: mortar 42 kg (92.6 lb); HE bomb 1.72 kg (3.79 lb)
Maximum ranges: (direct fire) 500 m (547 yards); (as mortar) 2050 m (2,242 yards)

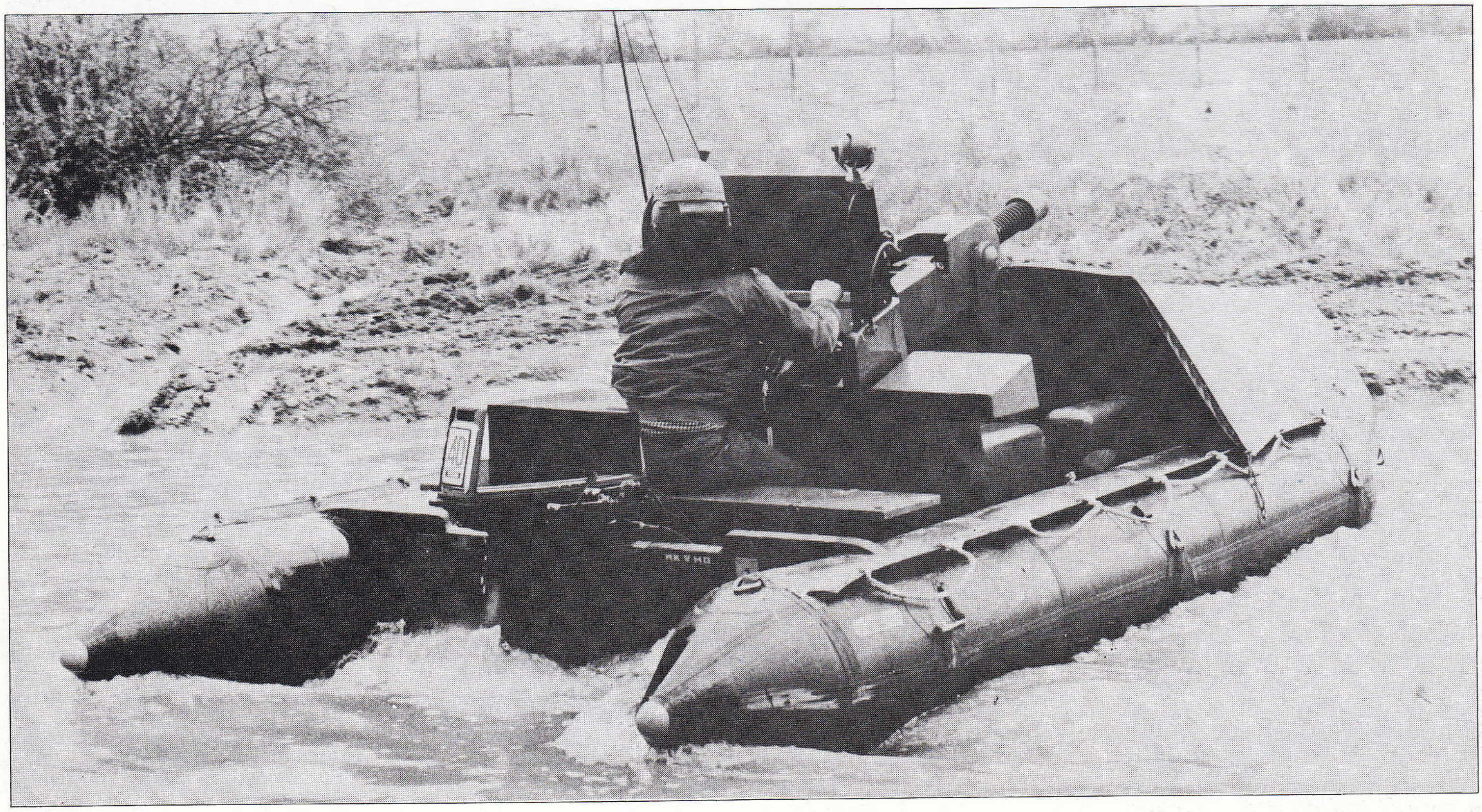
81-mm (standard model)
Calibre: 81.4 mm (3.2 in)
Length: 2.3 m (90.55 in)
Weights: mortar 500 kg (1,102 lb); HE bomb 4.45 kg (9.8 lb)
Maximum ranges: (direct fire) 1000 m (1,094 yards); (as mortar) 8000 m (8,749 yards)

Above: The combination of gun-mortar and light turret provides any light mounted vehicle with a powerful armament that can be used either for direct fire or long-range plunging fire. Here the gun-mortar is mounted in a SIBMAS carrier in place of the more normal 20-mm (0.787-in) cannon.

Below: A Brandt 60-mm (2.36-in) gun-mortar is fitted in the turret of a SIBMAS armoured personnel carrier. This is the LR (long-range) model of the weapon, which has a longer barrel. Used on this type of mounting the bombs are normally breech-loaded, and are fired using a percussion trigger.

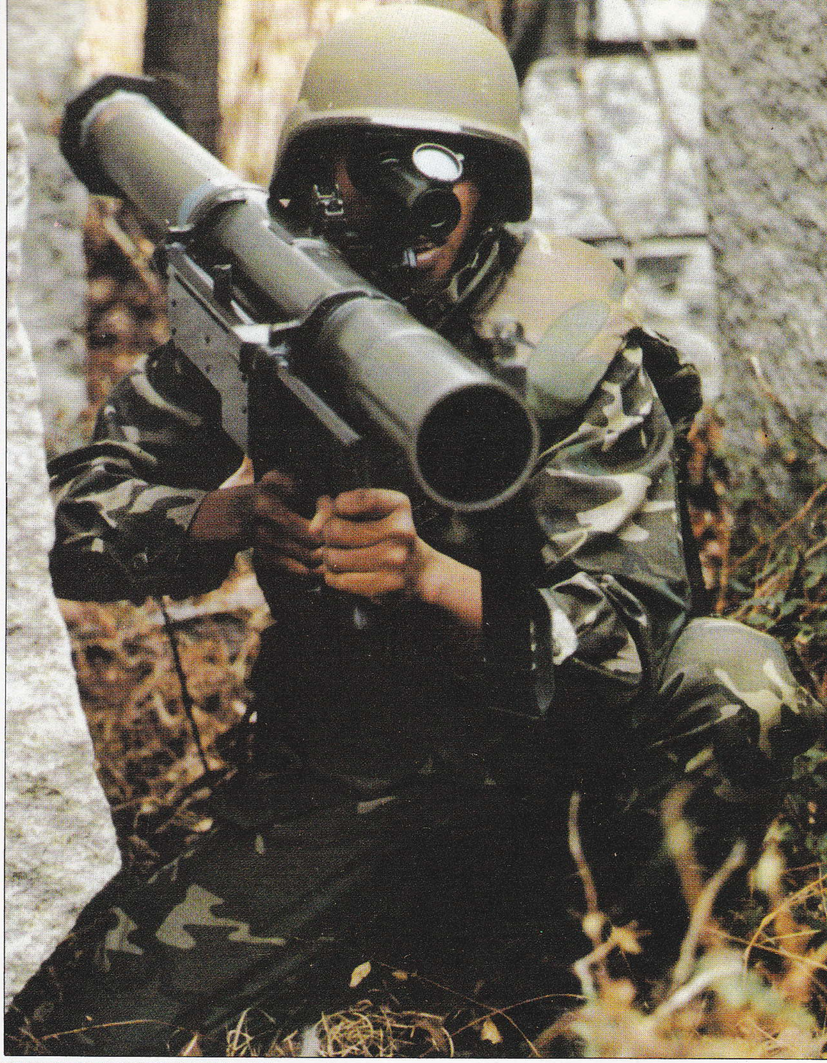


Below: A Brandt 60-mm (2.36-in) gun-mortar mounted on a Zodiac inflatable craft to demonstrate the light trunnion loadings of this type of weapon. The gun-mortar may be breech or muzzle loaded.



Future Firepower

Once a most primitive weapon, the mortar has developed since World War II into an increasingly sophisticated system, now on the threshold of firing guided projectiles. Infantry firepower has been further increased by the use of grenade launchers: rifle-mounted launchers are now being supplemented by automatic weapons like the 'Flame'.



The American SMAW (Shoulder-launched Multi-purpose Assault Weapon) is a derivative of the Israeli B-300 anti-armour weapon developed for the US Marine Corps. They use it as a bunker-busting weapon that can be aimed using a spotter rifle under the launcher tube. The launcher is all-American, as are the sights.

Modern infantry weapons may appear to have reached a plateau of development perfection. In the field the modern infantry company or battalion can carry into action enough destructive or support fire potential to outfight its World War II equivalent many times over, and the weapons are now not only more powerful and longer-ranged but also far more portable. For all this, however, the mortar of World War II looks very similar to its modern descendant and so does the ammunition. So where might the mortar go in the years ahead?

The short answer is that it will go a very long way. Already modern mortars have ranges that are nearly double those of World War II, and chemists and ballistic designers keep coming up with yet more formulations to create yet higher muzzle velocities for the bombs already in use. This increased muzzle velocity can be converted directly into range, but also has its cost. The propellant charges keep getting larger and heavier, and burn at ever-increasing temperatures. This extra heat has to go somewhere, and much of it is transmitted to the barrel, causing the metal to expand so much that the bomb cannot fall to reach the firing pin or else suffers propellant ignition before it can be conventionally fired. Either course of events will cause more than problems for the crew involved. The way ahead here is to use special steels or other materials (perhaps ceramics) for the barrel, which could be expensive and difficult, or else modify the charges to ensure lower burning limits. It is along this latter course that much promise is foreseen. One other unwelcome side effect of these hot and heavy propelling charges can be mentioned by any mortar team. The muzzle blast and flash resulting from a heavy charge can be dreadfully damaging to the ears and other senses: the American version of the British L16 81-mm (3.19-in) mortar has had to be fitted with a special cone over the muzzle to divert muzzle blast upwards and away from the mortar team. This modification has been fitted at the behest of the US Army medical authorities, who consider it an essential fitment. Other armed forces make no such concessions to their personnel, but might have to do so in future.

Another area for future improvement in mortar technology is aerodynamics. Recent innovations in the artillery projectile field have resulted in some startling increases in potential range as a result mainly of special streamlining, and it seems possible that similar improvements could be made to mortar bomb outlines, some of which have changed but little for years. Then there is the recent use of obturating rings around the bomb body periphery to prevent propelling gases 'leaking' between the bomb and the sides of the barrel during the firing phase; this is known as windage. The leaking gas is simply wasted and cannot assist the bomb on its travel, and can also have a random effect on the trajectory, thus reducing accuracy. The obturating rings are usually of a hard plastic material, and allow the bomb to fall freely onto the firing pin but open under gas pressure to seal the gap between the bomb and the barrel walls. Despite the success of these rings on bombs used by modern mortars such as the British L16, there is still room for improvement in their use and many mortar systems still do not use them at all.

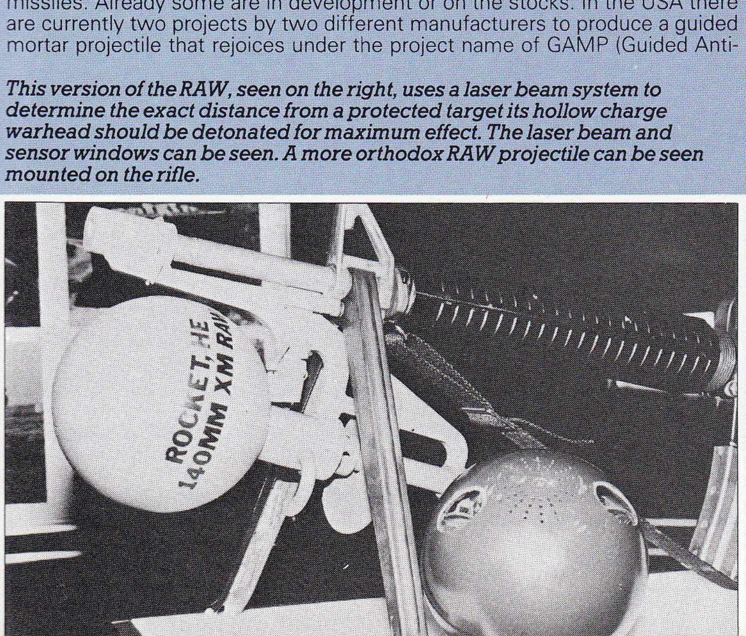
Anti-tank mortars

The mortar is a high-angle-fire weapon, a factor which makes it pretty useless as an anti-tank weapon. The long flight time of the projectile make the chances of hitting a moving target (such as a tank) fairly remote, even using modern forward observer techniques, but there is a considerable school of thought that states that in the type of battle where massed armour is expected to be used every weapon type must play some part in attempting to halt the onward advance of the armour. This has led to a reassessment of the anti-tank role of the mortar, and to the introduction of what are virtually mortar-launched guided missiles. Already some are in development or on the stocks. In the USA there are currently two projects by two different manufacturers to produce a guided mortar projectile that rejoices under the project name of GAMP (Guided Anti-armor Mortar Projectile). Although the two projects differ in detail they both rely on a forward observer using a laser designator system to project a laser beam at the desired target: the descending mortar bomb senses the laser energy reflected from the target and sprouts small wings to guide the bomb towards it, where an orthodox anti-armour warhead works in the usual manner. GAMP is still very much in the project stage, but it is anticipated that a service version will emerge.

Europe was an early entrant in this field, for experiments were conducted in Sweden and West Germany during the 1970s on mortar-launch guided projectiles. The Swedish programme was terminated when the costs rose too high but the German project, known as Bussard (buzzard) worked quite well before the money was switched to other things. One thing all of these weapons have (or had) in common was size. The European projects were at least 120 mm (4.72 in) in calibre, and GAMP is intended for use in the existing 107 mm (4.2-in) rifled mortars. However a British project now in its early stages and known as Merlin is intended for use with the British L16 81-mm mortar and relies upon millimetric radar target detection for its terminal guidance. Merlin is a very long projectile and its range will no doubt be reduced from the usual, but its shaped charge warhead could have lethal effects on the relatively thin top armour of a tank.

Apart from mortars, the entries in this analysis all indicate that the ordinary foot soldier is increasingly likely to be carrying his own fire support weapons as he moves into action in the years ahead. Two manifestations of this trend are already evident, one being the increasing application of small-calibre projected grenades such as the Soviet 30-mm (1.18-in) and American 40-mm (1.575-in) weapons; the UK may well be entering the contest with a 37-mm (1.457-in) grenade system. The other manifestation is the American RAW (Rifleman's Assault Weapon), a deceptively simple concept that has still to be fully developed for its full potential to be realized. RAW has a considerable destructive potential when compared with the smaller grenades, but it is very much a one-shot weapon at present and its range is still relatively restricted. But it does provide the foot soldier with the firepower potential of a small field gun, and what really matters to the soldier in action is that he has that potential literally at his fingertips, to use as and when he needs it most. Mortars and their ilk may be all very well as far as the soldier is concerned, but such weapons need an established communication network in which to function, along with the commitment of a large number of men who might well be needed elsewhere. Thus it is with portability and ease of control that the future of infantry support weapons might well lie, and it would appear that the infantry of tomorrow may be far more powerfully armed than they are even now.

This version of the RAW, seen on the right, uses a laser beam system to determine the exact distance from a protected target its hollow charge warhead should be detonated for maximum effect. The laser beam and sensor windows can be seen. A more orthodox RAW projectile can be seen mounted on the rifle.

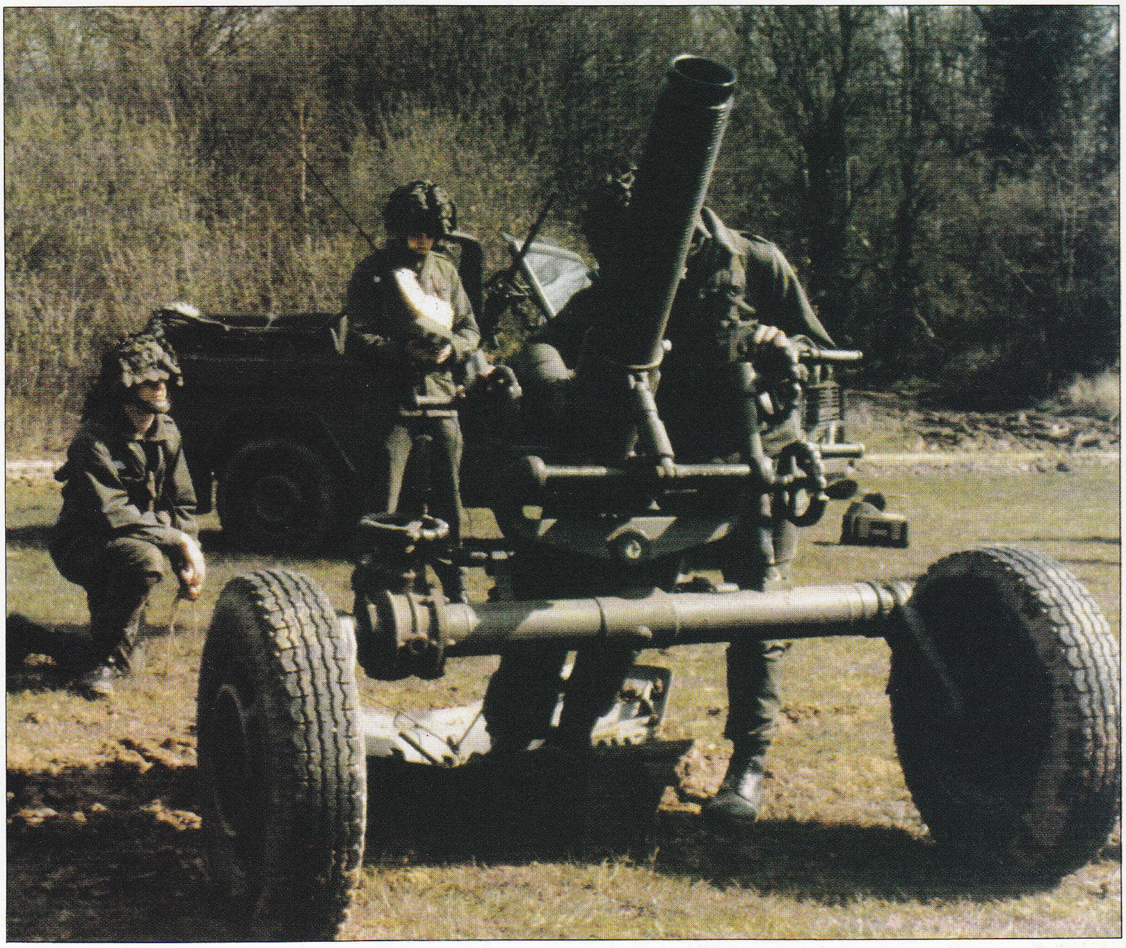


Brandt mortars

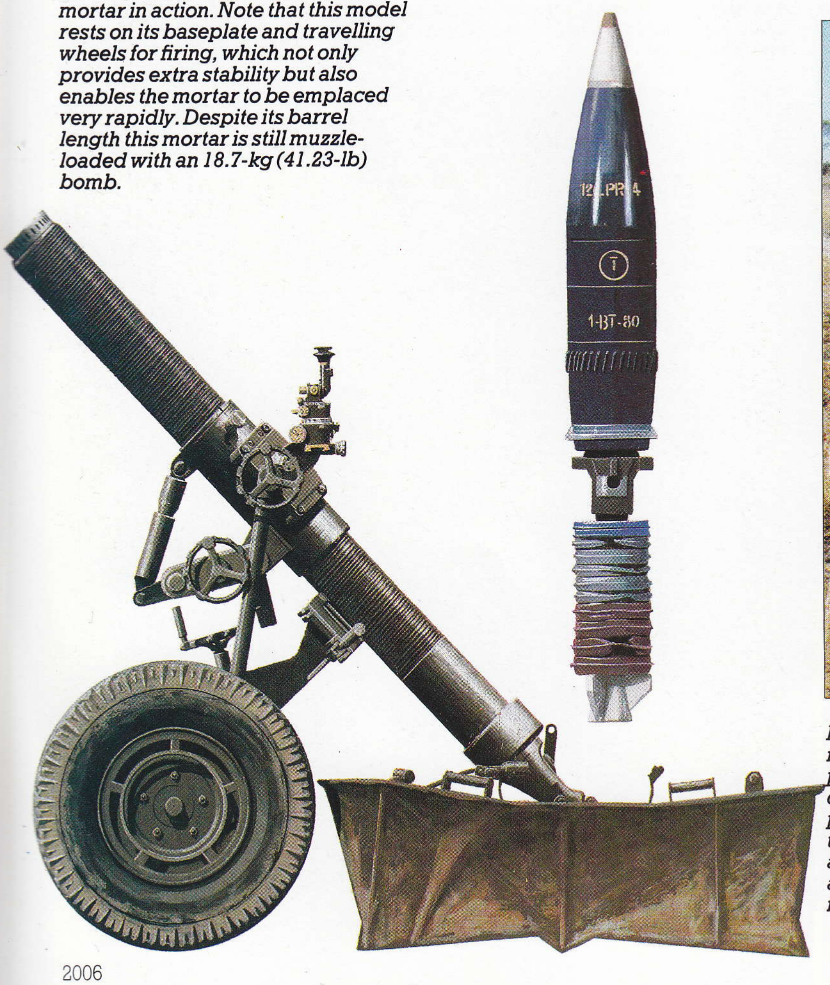
The name Brandt has been associated with the design, development and production of all types of mortars since World War I, when the mortar in its present form first appeared. Much of the detail development work that was carried out between the wars was carried out by a concern known as Stokes-Brandt, and this concern is now part of the Paris-headquartered Brandt Armements. Today the range of mortar types that the company produces is prodigious, but confined to three main calibres: 60 mm (2.36 in), 81 mm (actually 81.4 mm/3.2 in) and 120 mm (4.72 in). In the largest calibre Brandt produces two basic versions, smooth-bored and rifled.

The **Brandt 60-mm** mortars vary from quite complex and heavy models with extremely long barrels to very simple and light 'commando' models with no bipod and only a simple baseplate. The long-range models can produce some quite startling ranges for such small calibre bombs, for even using standard bombs a 5000-m (5,468-yard) range is possible. This range has to be purchased at a price in size and weight, but it is a price some armed forces are willing to pay. By contrast the simple Commando model weighs only 7.7 kg (16.975 lb) in its simplest form (without a trigger mechanism) and can fire a wide range of ammunition types to a range of 1050 m (1,148 yards).

In the **Brandt 81-mm** mortars the company again produces a wide array of models from simple light versions to special long-barrelled models to obtain maximum range. In design terms all of them are fairly orthodox,



Above right: A Brandt 120-mm rifled mortar in action. Note that this model rests on its baseplate and travelling wheels for firing, which not only provides extra stability but also enables the mortar to be emplaced very rapidly. Despite its barrel length this mortar is still muzzle-loaded with an 18.7-kg (41.23-lb) bomb.



Left: The Brandt 120-mm (4.72-in) mortar has a rifled barrel. The projectile shown is an HE bomb complete with a full array of propelling charges forward of the tail; these can be added or taken away to vary the range. Some can also have rocket assistance motors to further increase the range.

Above: Seen here in the capable hands of the 2nd REP (French Foreign Legion parachutists), the Brandt 120-mm (4.72-in) MO-120-60 combines the firepower of a heavy mortar with the mobility of a much lighter weapon. It fires a 13-kg (29-lb) bomb to a maximum range of 6610 m (7,229 yards).

and all have been sold to a number of armed forces around the world. To go with them Brandt also produces a wide range of 81-mm bombs and propelling charges. The bomb types include straightforward HE bombs, HE bombs with special high-fragmentation effects, smoke bombs, illuminating bombs and special target-marker bombs for indicating targets to aircraft.

But it is with the **Brandt 120-mm** mortars that the company today has its biggest impact. With this calibre the mortar can be a highly versatile adjunct to conventional artillery, and many armies use 120-mm mortars in place of artillery. The smooth-bore models in this range are conventional mortars that can be used in exactly the same way as smaller-calibre models, but the rifled mortars are much more complex and in many ways resemble conventional high-angle guns. The rifled weapons fire pre-rifled projectiles whose range can be enhanced by the use of an auxiliary rocket unit that cuts in only when the bomb is at the top of its trajectory. A typical range with this rocket assistance is 13000 m (14,217 yards) for an HE bomb weighing 18.7 kg (41.23 lb). Despite their size and weight, the Brandt rifled mortars can thus have a very useful performance and many nations are now actively investigating these weapons for possible use with light or rapid-response airborne forces.

Specification

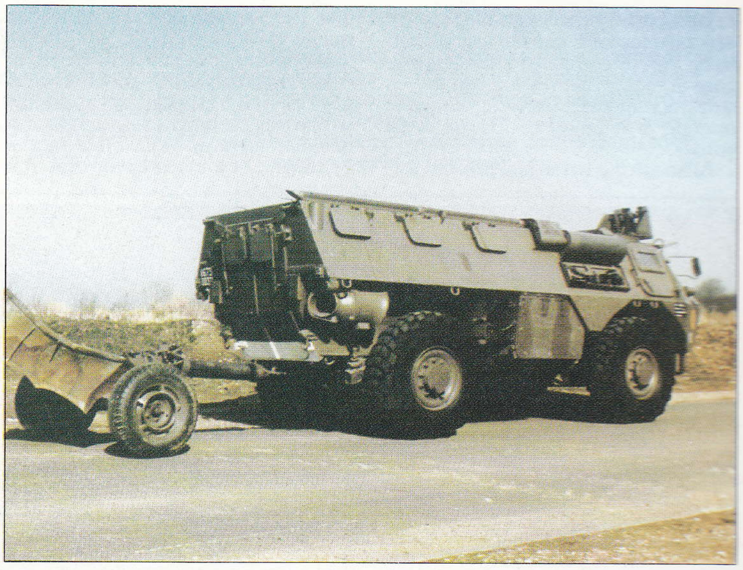
MO-120-RT-61

Calibre: 120 mm (4.72 in)

Length: barrel 2.08 m (81.9 in)

Weights: mortar 582 kg (1,283 lb); bomb (HE) 18.7 kg (41.23 lb)

Maximum range: (rocket assist) 13000 m (14,217 yards)



A Brandt 120-mm (4.72-in) rifled mortar on tow behind a VAB 4×4 armoured personnel carrier of the French army. The mortar is carried with the large baseplate still attached, ready for rapid emplacement at the firing position.

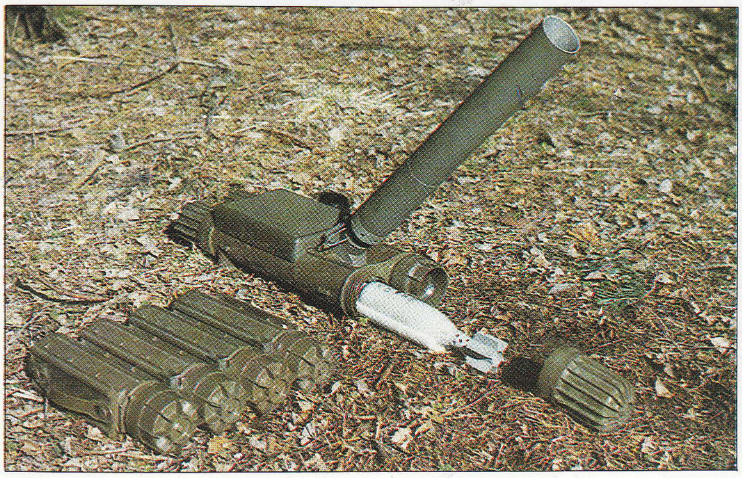
SWEDEN

Lyran

The **Lyran** is a special form of infantry support weapon for it fires only an illuminating round. The use of infantry support weapons to fire illuminating rounds is nothing new, but it is becoming an increasingly important one with a host of applications. Mortars have for long been used to fire special bombs that eject a small parachute at the apogee of their trajectory and then descend as high-power flares, spreading their light onto the ground below. This light can be used to illuminate an attacking enemy, or to reveal an armoured target for missile teams to tackle, and these are only two applications; the Lyran is a simple mortar system that can be used for all of them.

The Lyran has been designed, developed and produced by AB Bofors. In its infantry version (there is also a variant designed for use on combat vehicles) there are two packs, both formed from polyethylene plastic. One contains the barrel and two flare shells, and the other contains four flare shells. For use the barrel is taken out of its pack and screwed into a housing on the pack itself. The firer actually sits on the pack and uses a simple spirit level to set the barrel at an angle of 47°. A flare shell is then taken and a simple nose fuse is set to operate at a range of 400 or 800 m (437 or 875 yards). The shell is then allowed to fall to the base of the barrel and is fired in the normal manner, rising to a height of between 200 and 300 m (656 and 984 ft) before the parachute emerges to give the flare a burn time of about 25 seconds. At a height of 160 m (525 ft) the flare illuminates an area about 630 m (689 yards) in diameter, although this will vary according to the wind and other weather factors.

Although it is not definitely stated anywhere in the manufacturer's literature, the Lyran packs can be discarded after use or retained for subsequent filling and reuse. The Lyran is in service with the Swedish armed forces, has been sold to Switzerland and Belgium, and has also been used for guard duties by United Nations forces in the Middle East. It has proved to be a very reliable piece of equipment and well worth the investment of a special projector reserved purely for the illuminating role. The combat vehicle variant can be mounted in single-



This Lyran is set up ready for firing with the barrel container doubling as the baseplate and as a seat for the firer.

Above: A soldier carries a Lyran launching system into action. The container in his right hand holds the barrel and two illuminating bombs; the other container holds four bombs. The Lyran launcher is used for target illumination only and does not fire HE bombs. It can also be used mounted on vehicles.

or twin-barrel versions on a tank turret or similar location, and has also proved to be very useful in armoured operations at night. This version can use an extra incremental propelling charge to operate at a range of 1300 m (1,422 yards).

Although the Lyran is at present unique, its success will no doubt lead to similar devices in the future. Target illumination for anti-tank or other weapon teams is now an entrenched operational requirement, and the Lyran can produce much better illumination than an equivalent mortar bomb and at a much lower cost. It is simple to use by virtually any soldier (and it must not be forgotten that firing flares using a mortar is no job for the untrained), and it can be taken by any soldier to any location.

Specification

Lyran (infantry series)

Calibre: 71 mm (2.795 in)
Weights: barrel pack 9 kg (19.84 lb); ammunition pack 8 kg (17.64 lb); flare shell 1.17 kg (2.58 lb)
Operating ranges: 400 or 800 m (437 or 875 yards)
Flare burning time: 25 to 30 seconds

USA

M224 Lightweight Company Mortar

For many years the US Army has used the 81-mm (3.2-in) M29 mortar as its standard mortar, and although this weapon has been fairly successful it is now regarded as lacking range. It is also regarded as rather heavy, and during the Vietnam conflict it proved itself too heavy for the conditions encountered. It was therefore decided to fall back onto the old World War II 60-mm (2.36-in) mortars, but these too had for long been known to be lacking in range. What was needed was a compromise weapon between the old 60-mm mortars and the 81-mm M29. This led to a lengthy and involved programme of development that has now resulted in the 60-mm **M224 Lightweight Company Mortar**.

The M224 has now been issued to infantry, airborne and airmobile infantry units. Although no data regarding weights or dimensions relating to the M224 have been released, it appears to be a long-barrelled weapon that can be fitted with either a conventional bipod or a simple baseplate for use in the 'commando' configuration. Much use has been made of aluminium alloys for components such as the large baseplate, and it is known that the entire weapon can be broken down into two loads for manpack transport. It is also possible to mount the weapon on some vehicles.

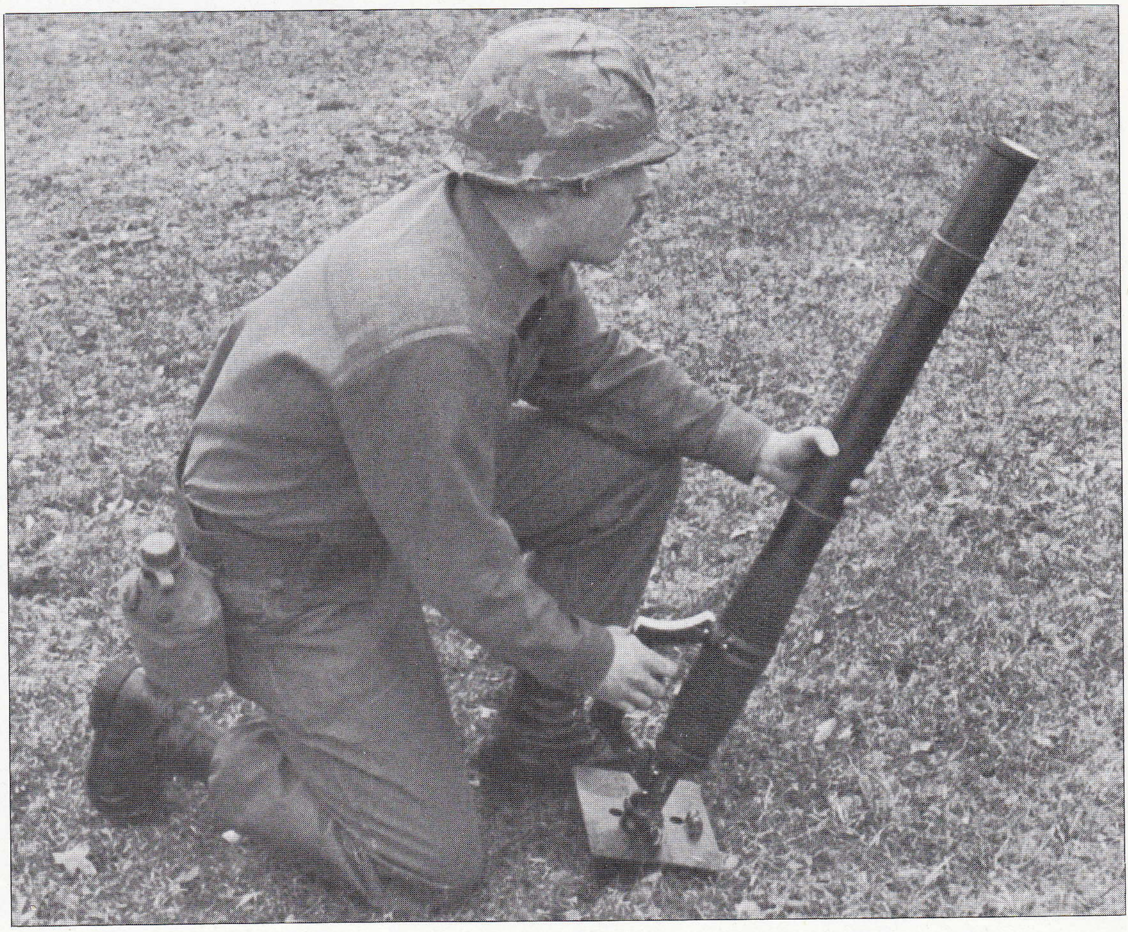
Perhaps the most important design feature of the M224 is the ammunition it fires, and especially the multi-option fuse involved. The M224 fires HE illuminating, smoke and practice rounds, and the multi-option fuse is known as the M734. This is an electronic fuse, and as it was among the first of its type to reach service it has been the subject of much attention. The M734 has four detonating options: high airburst, low airburst, point detonation and delay. The fuse has inbuilt redundancy, in that if the chosen option does not operate the fuse automatically activates the next option. For instance if low airburst has been selected and does not operate the fuse will detonate on point contact, i.e. when it strikes the ground; if that fails it will switch itself to delay. Power to operate the microcircuits is generated inside the fuse by air passing through a miniature turbine in the nose.

The ability to select high or low airburst (with a reasonable certainty that the fuse will operate as selected) considerably enhances the destructive effect of the bomb: the number of fragments spread over a wide area comes close to the destructive and anti-personnel effects of the larger 81-mm bombs. However, the electronic fuses are very expensive to produce, and have to be churned out in very large numbers to enable the economics of scale to bring the costs down to reasonable levels.

To go with the M224 and its electronic-fused bombs the US Army now uses laser rangefinders to determine target ranges accurately and so allow the first bombs arriving on target to have the maximum effect. Thus the little M224 lightweight company mortar is now at the stage where it is no longer a simple mortar but almost in the bracket where it can be considered to be a weapon system. It is also at the stage where the costs of the whole programme are such that the recent purchase of the British L16 81-mm mortar may bring the whole subject to an end before it prices itself through the US Treasury roof.

No data available.

Right: On exercise in South Korea a US mortar crewman shoulders the weight of the tripod for the M29 81-mm mortar. Experience in Vietnam led the US Army to conclude that the 81-mm weapon was too heavy and cumbersome; this led to the development of the M224 60-mm lightweight mortar.



The US Army's M224 lightweight company mortar is seen here about to be fired from its simple baseplate. This mortar can also be used with a more conventional bipod; in either form the bomb can be fired using the 'drop firing' method or a trigger mechanism. A multi-function fused bomb is employed.

The Night Belongs to Charlie

The essence of guerrilla warfare is to hit and run – advance when the enemy is weak, and retreat when he is strong. During the day many areas of South Vietnam were deceptively peaceful: US and ARVN troops patrolled the countryside encountering nothing but the odd booby-trap. But after sundown, government officials retired to their bunkers and military posts stepped up their guard. Shielded by the darkness, the guerrillas silently moved to the attack.

Although the fact seems to have escaped many modern military writers, the long campaign in Vietnam was primarily a guerrilla war. From time to time North Vietnamese forces would concentrate to carry out some large-scale operations, but for most of the time the forces in South Vietnam operated in classic guerrilla style, using hit-and-run tactics.

By the time US armed forces were established in Vietnam the guerrillas had more than perfected their tactics. Almost since the end of World War II the guerrillas had been fighting a series of protracted campaigns to rid themselves of various occupation forces, starting with the French, and by the late 1950s they were already encountering increasing numbers of Americans, at first 'advisers' and later genuine operational units. With them the latter brought virtually the full spectrum of American service life from the universal PXs to front-line combat aircraft. In between were the many and various support and combat services, and together these gradually occupied an increasing amount of real estate in South Vietnam. The Americans' first bases were easy to infiltrate and became the subject of a series of simple guerrilla attacks that ranged from the concealed bomb to the sudden gun attack. It was not long before the Americans tightened up their internal security, and the bases soon resembled forts of a bygone military era. These 'forts' were complete with earthworks, watch towers and security gates, and everywhere barbed wire proliferated.

But try as the Americans might, the US bases were always isolated islands in a sea of foreign

Below: The target – a Special Forces camp in the Central Highlands. The establishment of these isolated posts enabled large areas of Vietnam to be patrolled by US troops, government units or tribal mercenaries, but the camps themselves were vulnerable to attack.

Below: Jungle airstrips made ideal targets for sneak mortar attacks, so aircraft had to load and unload at lightning speed. Here a de Havilland DHC-4 Caribou approaches the Special Forces camp in II Corps.

territory. Some of the larger air bases were close to large areas of population, but many more installations were simply bases of one kind or another placed in splendid rural isolation. Typical of these were the many field artillery posts known as fire support bases. From within a whole series of these bases dotted around the countryside the US Army field artillery could direct supporting fire against any location under threat of attack. In their turn they were wide open to counterattack, not by artillery fire but from a whole array of guerrilla methods. These ranged from rocket to mortar fire, with the constant threat of sniper fire thrown in.

Despite their best efforts the Americans could never entirely rid themselves of these guerrilla attacks. A constant stream of infantry patrols spread out from the bases at all times of the day or night by helicopter and on foot. They made a great deal of noise and often sprayed the local terrain with streams of gunfire of every calibre, often directed at nothing more than the local vegetation. These firepower patrols looked good on American television back home but did little to remove the guerrillas, who simply made themselves scarce whenever a patrol was in the offing. All too often innocent civilians were victims, and in their resentment frequently turned to the guerrillas, offering aid and concealment.

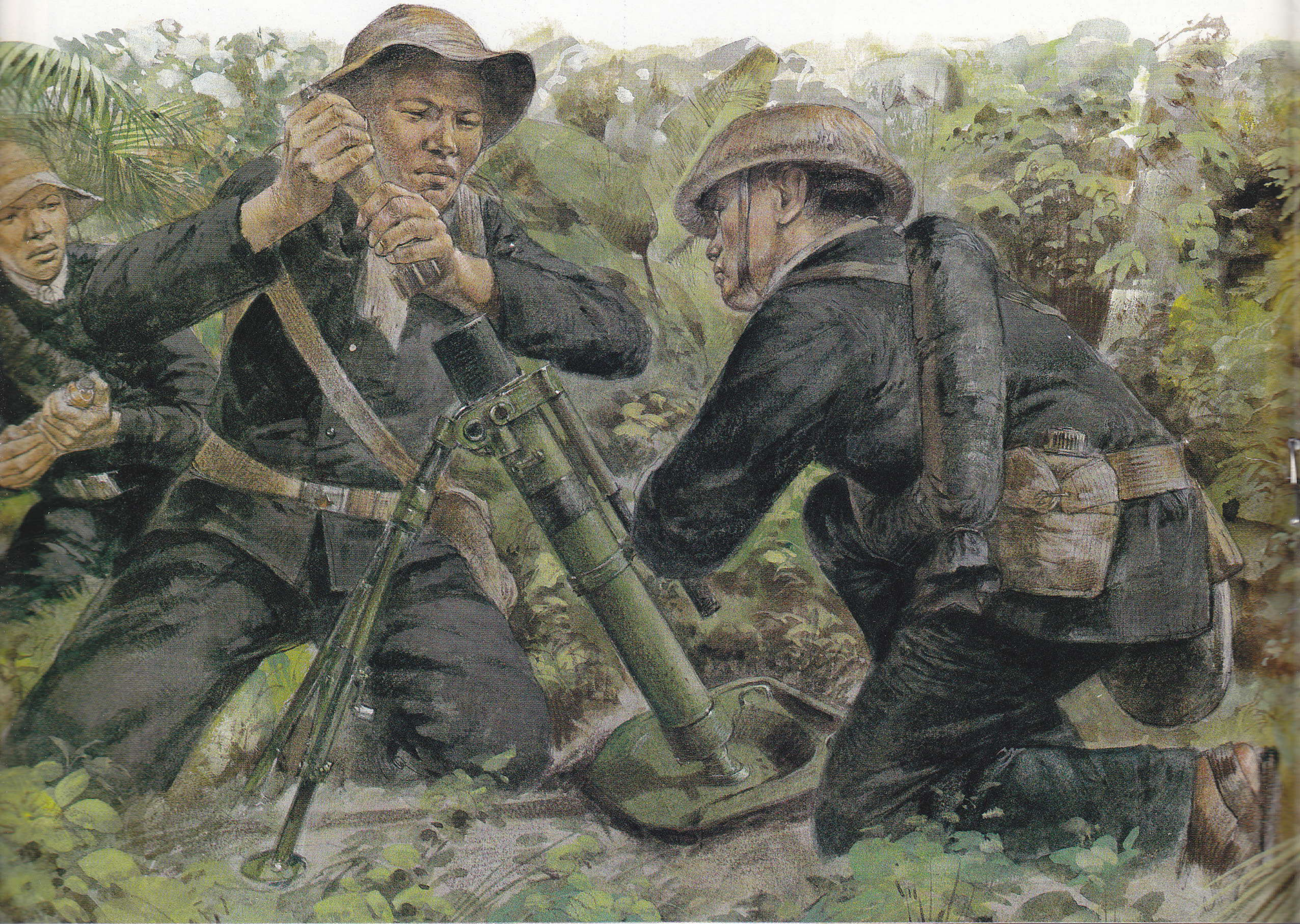
Thus by the late 1960s the Americans were in the position of having to send in more and more men and equipment to counter the constant guerrilla activities. At times it became almost impossible to operate some of the air bases as a result of the constant state of armed readiness of the ground staff and their guards. A small attack from a couple of snipers often meant that the whole base had to be placed on a level of armed alert that brought virtually all activities to a halt, though matériel damage was usually negligible. What did cause damage was the night attack.

Operating under darkness the guerrillas could often bring up heavier weaponry for more harmful attacks. Despite the fact that American patrols operated outside the base perimeters the guerrillas could often worm their way past the main guarded points and approach the base wire ready for their attack. They had two main weapons with which to reach inside the base area, be it an air base or one of the many other types of base installation. One of these weapons was the single-shot rocket, and the other the mortar. The single-shot rockets were ideal guerrilla weapons: a single rocket and its launcher tube or rail could be carried forward by a few men and fired before the crew decamped in a matter of seconds, and the same could be said for mortars. However, the mortar is a less indiscriminate weapon than the rocket, which is simply an area weapon. The mortar could thus be used against point targets.

By the late 1960s the guerrillas had brought the use of the mortar against bases to a high point of perfection. Careful reconnaissance would usually find a position close to the base perimeter where a mortar could be quickly set up and fired, but what was also needed was target information: what it was and exactly where it was located inside the base. It was not always possible to find from any position outside the base the exact location of, for example, an aircraft pen or a fuel dump inside the wire, so the guerrillas had to get their information from inside.

Viet Cong spies

Here they were usually considerably assisted by the fact that nearly every base had a proportion of the local population working somewhere around the base itself. Local labour often had to be used to build the defensive earthworks or carry out the usual mundane laundry tasks, and these workers had to have their own services such as latrine diggers, refreshment workers and so on. Within this internal population there was always someone who could be persuaded, not always very gently, or was genuinely willing to discover exactly what the guerrillas wanted to know. Thus the exact distance to a fuel installation could be determined by counting the number of paces from a

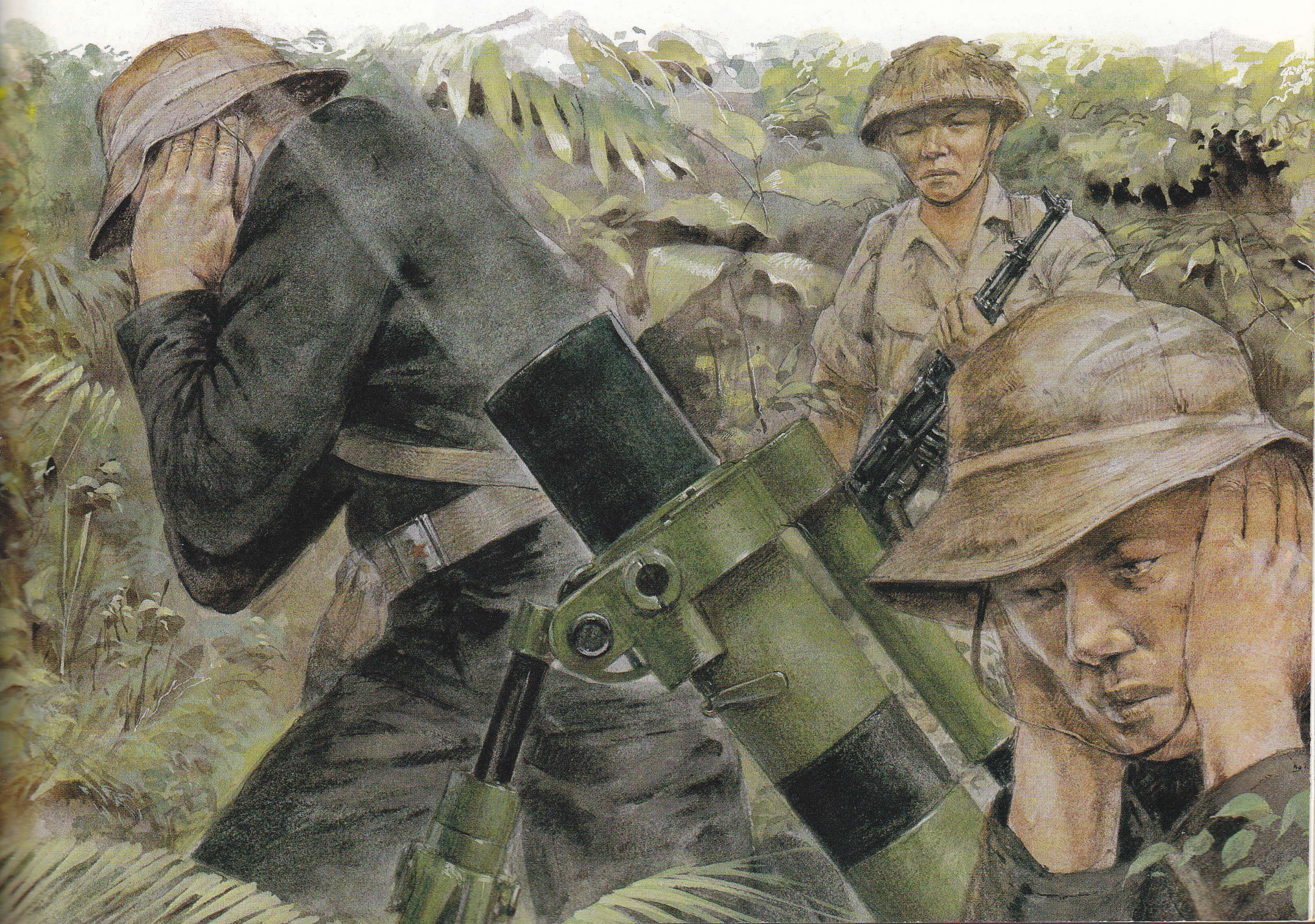


The Viet Cong mortar team opens fire on a US base concealed by both the darkness and the jungle. The mortars shown are Type 63, a French design adopted by the US Army, copied by the Chinese Nationalists and Communists in turn and then manufactured by the North Vietnamese.

known point. This information could be passed on by word of mouth, or by leaving a number scrawled on a post or under a stone. The guerrillas would then work out their ranges and all other firing data well in advance and their mortar attack could then be made when it suited them, usually at night.

The South Vietnamese guerrillas used a wide variety of mortars, but one of the most commonly used was a weapon known as the Type 63. This was a 60-mm (2.36-in) mortar with a rather odd development history. It was originally a pre-World War II French design that was adopted by the US Army as its M2. Numbers of these M2s were issued to the Chinese Nationalist forces during World War II, and the Chinese in their turn decided to manufacture the design as their Type 31. In their turn the Chinese Communists captured large numbers of these Type 31s, and they too decided to produce their own copy, this time as the Type 63. After the Type 63 reached the South Vietnamese guerrillas they in their turn added their own local modification in the form of a carrying handle on the barrel. The Type 63 was a simple weapon (and still is, for it remains in widespread use throughout South East Asia) that

Above: Discovering the location of the hidden mortars was no easy task; even in daylight the jungle canopy severely restricted visibility. The US Army soon introduced mortar locating radar which could track the trajectory of incoming rounds and spot the source of the fire but in this jungle on the Cambodian border the system failed to perform as well as had been hoped.



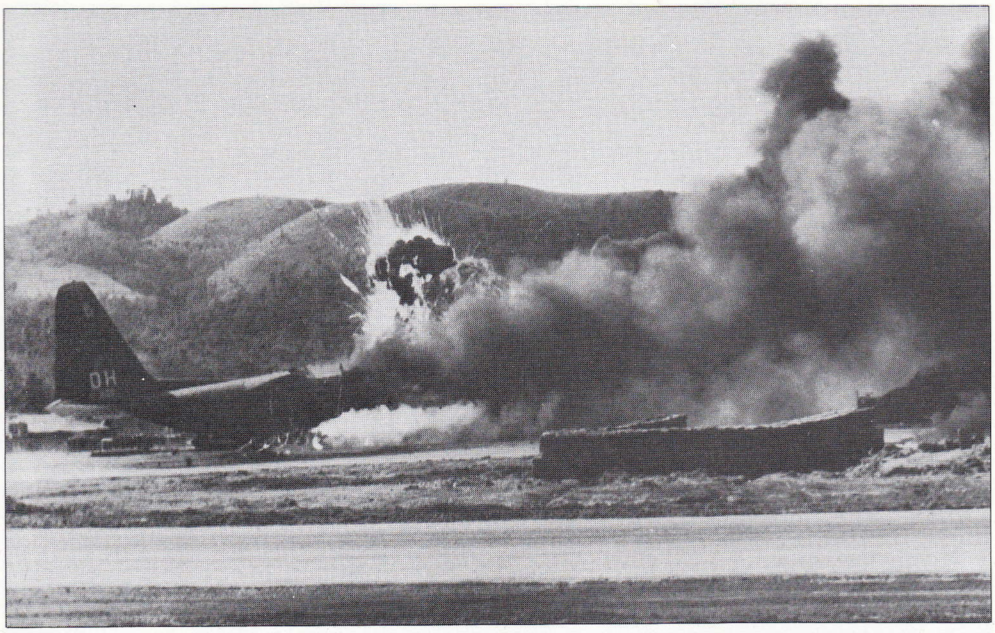
Numerous Vietnamese were employed as cooks, laundry staff and cleaners in US bases, enabling the guerrillas to obtain accurate measurements of the area and the location of key targets such as ammunition stores and command posts. The VC could thus deliver accurate fire without alerting the defences by firing ranging rounds.

could easily be carried by one man for it weighed only 12.39 kg (27.3 lb) in action and the barrel, baseplate and bipod were so arranged that they could all be carried connected to one another. Once at the firing site it took only a few seconds to emplace the mortar and use the sights to aim the barrel so that firing could commence. The Type 63 has a range of 1530 m (1,673 yards) and it can fire up to 20 bombs in a minute. Since a mortar bomb's time of flight is quite long, it was usually possible to fire at least 10 bombs before the first had landed on the target. Thus if it was lucky the mortar team could fire the last bomb and start to move off even before the first bomb had landed.

Radar location

The team had to be away quickly, for its members knew what would happen in retaliation. Any patrol in their area would rapidly move towards them and the full array of American weaponry would be directed against them. This could be anything from rifle fire to a visit from 'Puff the Magic Dragon', in the form of a Douglas AC-47 with its massed battery of rotary machine-guns. By the late 1960s the guerrillas' firing positions were often known before the first bomb had landed. Most of the larger bases were gradually equipped with special counter-mortar AN/MPQ-4 radars. These radars were originally meant for use on full-scale battlefields and kept up a constant watch by scanning a sector of terrain with a fan-like beam. If a mortar bomb went through this beam it automatically switched on a second beam above the first. As the bomb went through this second beam a computer could determine the exact firing position from which the bomb came. This information was originally meant to direct counter-mortar artillery or mortar fire, but in Vietnam it was used to direct patrols or gunships. In theory this should have meant the elimination of the guerrilla mortar teams, but this happened in only a very few cases. By the time the patrols or gunships got to anywhere near the team's position it was gone; the problem was where?

The answer often came many months later, for the guerrillas literally went underground. The area around many American bases was frequently riddled with a network of tunnels or bunkers that were entered through disguised 'traps' that were difficult to find, and once inside the network the guerrillas were safe. The searching patrols often walked over their heads as they hid, together with their weapons which were cleaned ready for the next attack.



'Arithmetic on the frontier': several million dollars' worth of Lockheed C-130 is blown up by a Viet Cong mortar bomb, costing less than a pair of boots, at Dak To airstrip, 1967. A well-aimed barrage could do substantial damage in a few minutes, and the VC were adept at melting into the jungle to avoid retribution.

Above: An M113 APC races along the perimeter at Dak To past the wrecked C-130. On this occasion the VC did not slip away after firing a few rounds, but maintained a heavy barrage of mortar bombs which eventually hit the camp's ammunition dump, with spectacular results.

Right: Dak To's 105-mm howitzer battery pounds the ridgeline where the VC mortars were thought to be dug in, a gunner ejecting the hot shell casing. US forces often had enormous firepower to hand, but locating the right target was rarely easy.

Far right: Although the 81-mm mortar proved a beast to carry along jungle trails, it enjoyed some success in its self-propelled form. Here the gunner loads a smoke bomb for registration fire on a site chosen for an airmobile assault near the Dong Nai river in III Corps.

USA

40-mm grenade-launchers

The American 40-mm (1.575-in) grenade family was originally developed to fill the gap between the maximum range of hand-thrown grenades and the minimum range of light mortars. The family generally known as the M406 grenades (there are dozens of different types) look like squat rifle rounds of large calibre and use a thin-walled cartridge case to fire them. The firing system is such that the propellant gases are allowed to flow through a series of vent holes into a chamber in which they are allowed to expand at a relatively low pressure, thus allowing quite light weapons to fire the grenades.

The first M406 launcher was the **M79**, which was a very simple design. To all intents and purposes it is a special single-round shotgun into which a grenade is hand-loaded after the action has been 'broken' and which is then fired from the shoulder in the normal way. The main drawback to the M79, which is still a widely-used weapon (it was used by the Royal Marines in the Falklands), is that its size means that it requires a soldier to carry and use it, and when he is doing that he cannot use a rifle. This has led to the **M203** launcher which is again a single-shot launcher but this time carried under the foregrip of an M16A1 or M16A2 rifle. This 'pump-action' launcher was selected for service during the late 1960s and has been in service ever since. It clips under the rifle so that it does not interfere in any way with the normal operation and carrying of the weapon, other than the additional weight of 1.63 kg (3.59 lb) loaded. Now almost every US Army section has at least one man (often more) with an M203 fitted to his rifle. The grenades fired are usually the M406 HE type, but also available are smoke, marker smoke, flares, CS riot control and so on.

The M203 can be used against point targets at ranges up to about 150 m (164 yards), although area targets can be engaged at almost maximum range which varies between 350 and 400 m (383 and 437 yards). At these ranges the performance of the grenades, especially the HE ones, is limited by the amount of internal space required by the impact fuse. This has to be relatively large to be fully effective and reliable, so the small payload has to be offset by the number of grenades fired at a target. This means multiple fire, and the M79 and M203 are both single-shot weapons, so a great deal of development work was undertaken on automatic weapons to fire the 40-mm grenades.

One early effort in this field was the **XM174** which came to nothing, for in recent years a development of the M406 grenade known as the M384 with increased payload and a more powerful propellant has arrived on the scene. To fire this an automatic launcher known as the **Mk 19** has been designed and it is now in production. Its mechanism is loosely based on that of the 12.7-mm (0.5-in) machine-gun, but the barrel is very short. Grenades are fed into the mechanism from a belt, and the rate of fire can be as high as 375 rounds per minute. The Mk 19 can be mounted on a tripod or a pedestal mount on a vehicle or light vessel. It has a much longer range than the single-shot weapons.

Specification

Mk 19

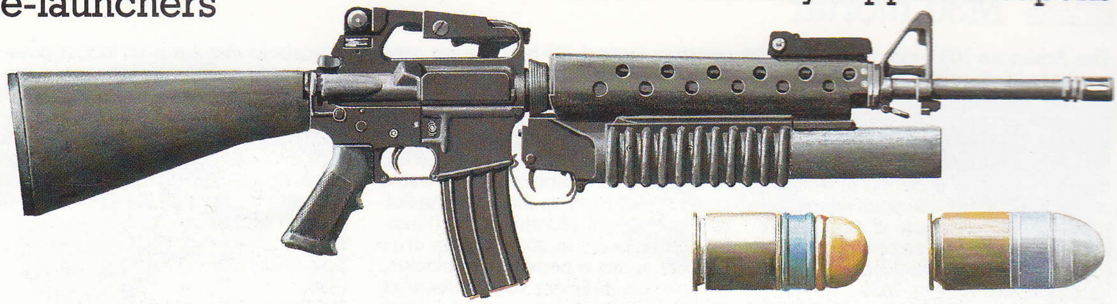
Calibre: 40 mm (1.575 in)

Length: overall 1.028 m (40.47 in)

Weights: gun only 35 kg (77.2 lb)

Rate of fire: 375 rpm

Maximum range: 1600 m (1,750 yards)



Above: An M203 is fitted to an M16A1 rifle and is shown with two typical types of 40-mm (1.575-in) grenade. The M203 can be used against point targets up to 150 m (164 yards) away, although larger targets can be engaged at ranges up to 350 m (383 yards). The loaded launcher weighs only about 1.63 kg (3.6 lb).

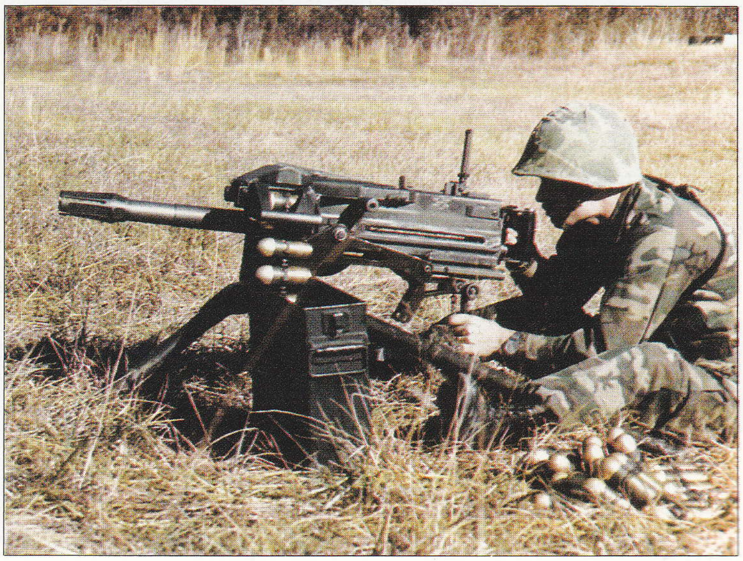
Left: The first weapon specifically made to fire spin-stabilized grenades, the M79 has a maximum effective range against area targets of 400 m (437 yards). A single-shot, break-open weapon, its size precludes the grenadier from carrying a rifle, which has led to the adoption of the M203.

Left: The single-shot, pump-action M203 is a great improvement over the M79, allowing the grenadier to use a rifle.

Right: US Recondos in distinctive 'Tiger Stripe' fatigues shoot M79s in Vietnam, where the grenade launcher was dubbed the 'Blooper' gun after a children's toy.

Below: A US Army recruit receives instruction on the use of an M203 40-mm (1.575-in) grenade-launcher fitted to an M16A1 rifle. The launcher sights can be seen, as can the method of fitting the launcher to the rifle forestock. The normal use of the M16A1 rifle is not impeded when the M203 is fitted.

Below: The Mk 19 automatic grenade launcher, seen here loaded with a belt of armour-piercing grenades, can shoot at a maximum rate of 375 rpm.



USA

M30 mortar

The American 106.7-mm (4.2-in) mortars have been around for a long time, for they were originally developed to fire smoke bombs before World War II. Since then they have been the subject of many improvement programmes and general updating of weapon and ammunition, to the point where the present-day version is no longer known as a 4.2-in mortar (except to the soldiers who use them) but instead is known as the 107-mm **M30**.

The present M30 is still a rifled mortar that fires a spin-stabilized projectile; indeed, many of the crews refer to their mortars as 'cannon'. In its present form the M30 no longer uses the original rectangular-shaped baseplate, but instead uses a heavy circular one with the barrel supported on a single column. The barrel can rotate on the baseplate and it is fitted with a recoil system to absorb what can be quite considerable firing forces. All this adds up to a considerable degree so that the complete weapon weighs no less than 305 kg (672.4 lb). This is quite a lot to get in and out of action in a hurry, so the size of the mortar crew and its carrying vehicle are correspondingly large. Many M30s are in fact not ground-mounted at all but are carried on special mountings inside M113 armoured personnel carriers to fire through roof hatches.

The ammunition used on the M30 more closely resembles an artillery round than a mortar bomb. It is of the type known as semi-fixed, for components of the charge can be added or removed as required. The range of projectile types has gradually been increased over the years, and there are now no less than three types of HE, two smoke, one illuminating and two 'chemical' rounds. Of the last, one contains chemical warfare agents and there are about seven or eight possible gases (although the round remains the same); the other type is less lethal and contains tactical CS that can be used for a variety of purposes.

For all its weight and general air of unhandiness the M30 is in use with many armies, mainly as a result of military aid hand-outs. However there are now signs that a replacement is being considered. High on the list is the Soltam lightweight 120-mm (4.72-in) mortar, but as usual in such foreign arms purchases this is being either blocked or delayed in favour of an American product. Since there is no American equivalent the only recourse is to update the M30 yet again, and there are indications that this is no longer possible, mainly as a result of sheer old age: many of the barrels are now so worn as to be virtually smooth-bored. The recent purchase of the British L16 mortar took over seven years to get through the various blocking moves, so for the foreseeable future at least the M30 will have to soldier on.

Specification

M30

Calibre: 107.7 mm (4.2 in)

Length: barrel 1.524 m (60 in)

Weights: in action 305 kg (672.4 lb); HE bomb 12.2 kg (26.9 lb); smoke bomb 11.32 kg (24.95 lb); gas bomb 11.17 kg (24.625 lb)

Maximum range: HE M329A2 6800 m (7,436 yards)

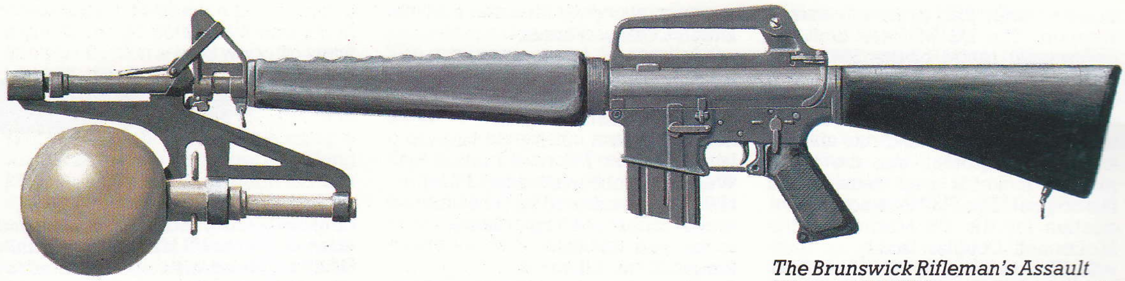
Firing any modern mortar can give rise to high-pressure muzzle blast that can cause serious ear damage, so mortar crews, like this one firing a 4.2-in (107-mm) mortar, keep their hands over their ears as the bomb is fired. Ear protectors are now usually issued to prevent damage, but soldiers still take precautions.

A 4.2-in (107-mm) M30 rifled mortar is laid on the ranges at Fort Dix, New Jersey. This mortar has been in US Army service in one form or another since World War II, and there are plans to extend its service life. Many of these mortars are carried in and fired from M113 APCs.

A 4.2-in (107-mm) mortar is seen in action during the Korean War of the early 1950s. As the war was fought along static trench lines for much of its duration, carefully prepared fire positions such as this sandbagged firing pit could be prepared along with shelters for the mortar crew.

USA

RAW



The Brunswick Rifleman's Assault Weapon (RAW) is mounted under the muzzle of a normal rifle, and is fired by using the rifle in the usual way. The flash ignites the cylindrical rocket, which then has an effective range of about 200 m (219 yards) for the demolition of large targets.

RAW stands for **Rifleman's Assault Weapon**, and it is an example of the degree to which the modern soldier can carry his own direct-fire support weapon. Whereas the 40-mm (1.575-in) grenades are relatively light weapons with limited explosive ability, the RAW is a much more powerful weapon that fires a projectile powerful enough to penetrate tank armour yet can still be clipped under a normal service rifle such as the M16A1.

The RAW is a rocket-propelled projectile that is fired from under the muzzle of a rifle, and is a sphere 140 mm (5.51 in) in diameter containing an explosive warhead that creates a 'squash head' effect when striking a target. This effect is powerful enough to punch holes through walls, structures or even tank armour. It is launched by firing a normal ball round from the rifle in the usual way: as the cartridge gas leaves the muzzle some of it is diverted to the RAW launcher under the muzzle to ignite the RAW rocket motor via an ignition cap. As the RAW projectile leaves the short launcher tube it is propelled by its motor, and flight stabilization is achieved by using two side tube effluxes that spin the projectile in flight. The projectile trajectory is quite flat to provide the weapon with an effective range of about 200 m (219 yards), although maximum range is some 10 times more than that. The RAW has considerable potential in street fighting, and if necessary could even be used to demolish or damage structures such as bridges.

However, the manufacturer of the RAW (Brunswick Defense) has already taken the weapon one stage further along the development path by making it into an even more powerful anti-armour or anti-structure weapon. It is appreciated that the squash-head warhead has its limitations, for the stand-off hollow-charge warhead is much more destructive weight-for-weight. The problem is how to achieve this stand-off detonation when using a spherical projectile. Brunswick has got around this difficulty by using a combination of lasers and electronics. The idea is that as the projectile moves forward it emits a low-power laser beam. If it strikes a structure ahead of the flightpath, some of the laser energy is reflected back towards the RAW projectile, where it is picked up by a laser sensor. As the projectile moves forward more energy will be reflected and detected until a point is reached where the optimum stand-off distance is reached. The hollow charge can then ignite and send forward its destructive flame jet for maximum effect.

Needless to say this RAW laser projectile is still very much in the development stage, as is the entire RAW project. However, it does offer some intriguing prospects for future development whereby one soldier will have at his disposal far more destructive potential than a small field gun, and all mounted on the conventional service rifle.

Specification
RAW

Projectile diameter: 140 mm (5.51 in)
Length: overall 0.305 m (12 in)
Weight: overall 2.72 kg (6 lb); projectile 1.36 kg (3 lb)
Ranges: maximum 2000 m (2,187 yards); operational 200 m (219 yards)

ISRAEL

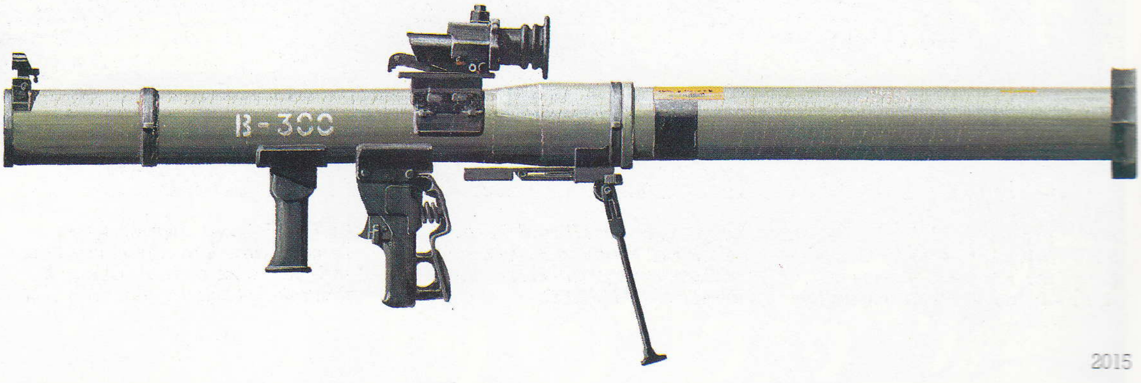
B-300 light support weapon

An Israeli soldier takes aim with the B-300 light anti-armour weapon. This weapon has a calibre of 82 mm (3.2 in) and fires a rocket projectile that is attached to the rear of the launcher in a sealed container. The B-300 is effective only against light armoured vehicles.

The Israeli **B-300** light support weapon is produced by Israel Military Industries and was originally designed as a light anti-armour weapon. However the warhead has a maximum diameter of only 82 mm (3.23 in), which is now regarded as too small to have much effect on the thick armour of main battle tanks. Thus the B-300 is currently used against light armoured vehicles and as a strongpoint demolition weapon at ranges up to about 400 m (437 yards)

The B-300 breaks down into two components: one is the launcher, which may be fitted with a variety of sighting options and is reusable; the other component is a sealed container for the missile. This is simply clipped onto the rear of the launcher and is immediately ready to fire. The launcher unit is fitted with a shoulder rest and a small bipod, and is carried in a wooden box when not required for action. The rocket has a HEAT warhead with good anti-armour effect, but it is equally efficient when fired against concrete or brick-built bunkers; it will also demolish earth and timber structures. Thus it can be considered as a very useful infantry support weapon that can also supply protection against armoured vehicles, rather than as an anti-tank weapon that can be used against structures. It is also relatively light and handy, weighing 8 kg (17.64 lb) ready for use, the rocket sealed in its container weighing 4.5 kg (9.92 lb). The sealed rockets are carried in a special backpack holding three rounds.

The B-300 has attracted a great deal of interest outside Israel, especially in the USA where the US Marine Corps has developed its own special version. This is known to them as the **Shoulder-launched Multipurpose Assault Weapon (SMAW)**. The SMAW differs from the basic B-300 in several ways, not the least of which is the inclusion of a spotting rifle combined with a new telescopic sight. The spotting rifle is a version of that used on the British LAW 80 anti-tank weapon, and fires bullets that provide a flash indication of where they strike the target. Used in conjunction with the American-developed telescopic sight this provides an accurate indication of aim. The rocket fired by the SMAW is also an American development, still enclosed in a sealed container but fitted with a multipurpose warhead as the SMAW will be used by the US Marines more as a

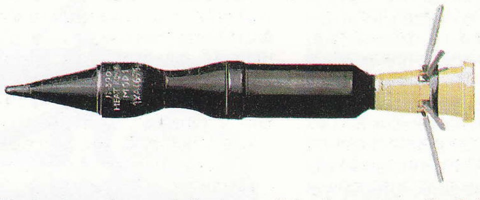


The Israeli B-300 light anti-armour projectile is connected to the launcher still inside its pre-packed and sealed container; only the forward section of the launcher in front of the support leg is re-usable. The weight loaded is 8 kg (17.64 lb).

bunker-buster than as an anti-armour weapon. The US Marines limit the operational range of the SMAW to 250 m (273 yards) although the rocket will travel farther than that. The SMAW is heavier than the basic B-300, mainly as a result of the spotting rifle and the sighting equipment, and the multi-purpose rocket is much heavier than the original. The SMAW is now in production for the US Marines at the McDonnell Douglas facility in Titusville, Florida, whereas there is no positive evidence that the basic B-300 has yet been accepted for service by the Israeli Defence Forces.

Specification

B-300
Calibre: 82 mm (3.23 in)
Lengths: loaded 1.35 m (53.15 in); launcher only 0.755 m (29.7 in)
Weights: launcher unloaded 3.5 kg (7.71 lb) and loaded 8 kg (17.64 lb); rocket container 4.5 kg (9.92 lb); rocket 3 kg (6.61 lb)
Range: 400 m (437 yards)
Armour penetration: 400 mm (15.75 in)



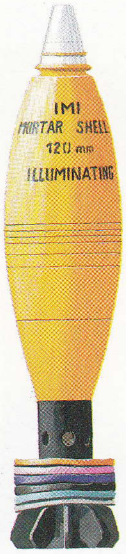
Originally designed as an infantry anti-tank weapon, the B-300 has been adapted by the US Marines as a 'bunker buster'. Certainly its 82-mm (3.2-in) HEAT warhead, although too small to deal with MBTs, would have disagreeable effects on the occupants of a pillbox.

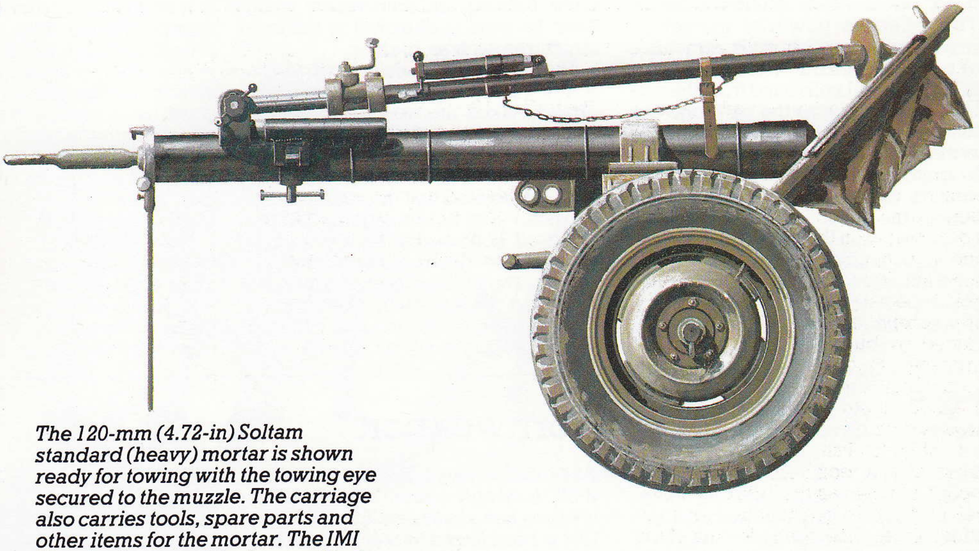
ISRAEL

Soltam heavy mortars

At its manufacturing facility near Haifa Soltam produces a full range of mortars, but it is with its heavy mortars that the company has made its name. Soltam produces two 120-mm (4.72-in) models and one of a massive 160-mm (6.3-in). All these models are large enough to warrant their own wheeled travelling carriages, though of the 120-mm mortars one is described as 'light' and the other as 'standard'. The light model is designed for infantry use, and is only carried into action on its wheeled carriage, and can be towed by manpower alone. The standard model is much more substantial and is intended for towing into action.

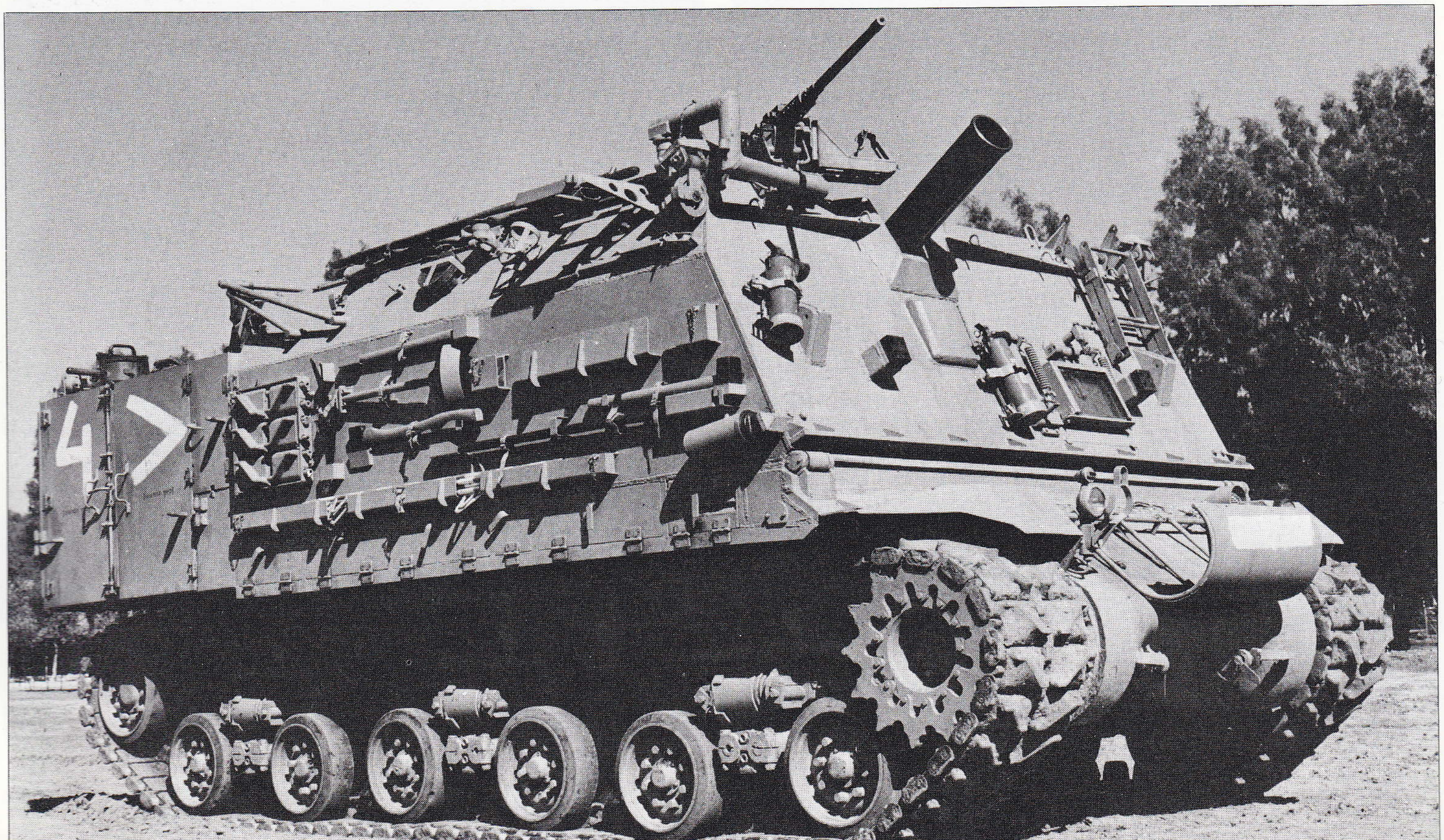
In range terms there is little to choose between the two **Soltam 120-mm** models, although the standard model has a slight edge. They both fire the same bombs and both can be mounted in armoured personnel carriers if required. The Israeli Defence Forces use the M113 'Zelda' for this purpose, although halftracks have also been used. The main advantage of both models is their considerable projectile weight: a 120-mm Soltam mortar bomb weighs 12.9 kg (28.44 lb), of which 2.3 kg (5.07 lb) is the TNT payload. These bombs have considerable destructive potential, and the 120-mm is thus used with increasing frequency instead of artillery for close-range fire support of infantry, especially by light rapid-response forces. It is





The 120-mm (4.72-in) Soltam standard (heavy) mortar is shown ready for towing with the towing eye secured to the muzzle. The carriage also carries tools, spare parts and other items for the mortar. The IMI illuminating round is shown with six propelling charges.

Below: The Soltam M-66 160-mm (6.3-in) mortar weighs 1700 kg (3,748 lb) in the firing position, so many of them have been fitted to modified M4 Sherman chassis. The M-66 fires a 40-kg (88-lb) bomb containing 5 kg (11 lb) of TNT to a maximum range of 9600 m (10,500 yards). Its 50 per cent zone is given as 0.75 to 1.5 per cent of range.



for this reason that the US Marine Corps is now actively considering the light model for potential service (although it remains to be seen if the model is ever accepted by the US Treasury and the Congress).

With the **Soltam 160-mm** mortar one is really getting into the heavy bracket. The usual model is known as the **M-66**, and is so large and heavy that it really comes into the artillery category. But many armed forces, including those of the Warsaw Pact nations, use this calibre for infantry support in place of conventional artillery as it is overall much simpler and lighter to produce and use (in a way, artillery on the cheap). Each M-66 has a crew of six to eight men, and getting the weapon in and out of action is hard work. To assist matters the M-66 uses its wheeled travelling carriage to support the weapon in action, and all the elevation and depression is achieved using a single column. As the barrel is too long for muzzle loading a breech-loading system has to be used, and this is so arranged that the barrel can be tilted forward for loading before returning to the correct angle of elevation for firing. This involves a rather complicated balancing system that adds much to the overall weight. The circular base plate has to be manually placed before firing and lifted out again after firing, a process that requires at least four men. The projectile fired is prodigious, weighing no less than 40 kg (88.185 lb).

With all this weight involved it comes as no surprise to learn that self-propelled mountings are often used. The Israeli Defence Forces use converted M4 tank chassis to carry these mortars, but many units still tow their M-66s in and out of action in locations where the M4s could not go.

Specification

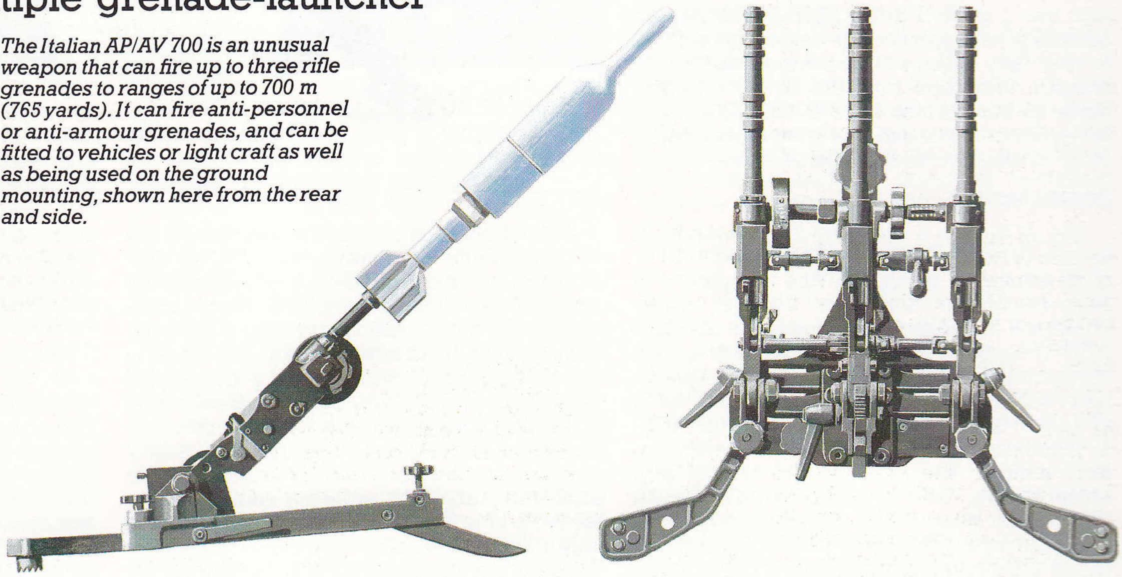
120-mm light
Calibre: 120 mm (4.72 in)
Length: barrel 1.758 m (69.2 in)
Weights: in action 140 kg (308.65 lb); bomb 12.9 kg (28.44 lb)
Maximum range: 7000 m (7,655 yards)

120-mm standard
Calibre: 120 mm (4.72 in)
Length: barrel 2.154 m (84.8 in)
Weights: in action 245 kg (540 lb); bomb 12.9 kg (28.44 lb)
Maximum range: 8500 m (9,295 yards)

M-66
Calibre: 160 mm (6.3 in)
Length: barrel 3.066 m (120.7 in)
Weights: in action 1700 kg (3,748 lb); bomb 40 kg (88.185 lb)
Maximum range: 9600 m (10,498 yards)

ITALY

AP/AV700 multiple grenade-launcher



The Italian AP/AV 700 is an unusual weapon that can fire up to three rifle grenades to ranges of up to 700 m (765 yards). It can fire anti-personnel or anti-armour grenades, and can be fitted to vehicles or light craft as well as being used on the ground mounting, shown here from the rear and side.

The rifle grenade launched from the muzzle of a normal service rifle is still used by many nations, but is not a fashionable weapon for several reasons: two of these are that firing a rifle grenade can often cause considerable recoil that damages the rifle, and that aiming is not always very accurate. In recent years the previous use of special propelling cartridges for firing grenades has been partially replaced by bullet traps in the tails of grenades to absorb the forces of a fired bullet and use them to propel the grenade. Again, accurate aiming is not always possible.

In Italy this has led to the development of a special infantry support weapon known as the **AP/AV700**. Developed by Luigi Franchi, this is in effect three rifle-grenade launchers set side by side on a common baseplate or launcher. The finned rifle grenades fit over spigots, and standard ball cartridges (loaded into the breech mechanisms at the base of each spigot) are used to launch them. The bullets are fired directly into the tails of the grenades, and the flash of their ignition is used to light a delay unit that in turn ignites a small rocket motor to increase the range of the weapon. Using this system it is possible to fire the grenades to a range of 700 m (765 yards). It is possible to aim the them fairly accurately and consistently, for in flight they are stabilized by their fins and also by gases vented from the rocket to add further spin to the grenade.

It is possible to fire the grenades using either the standard NATO 7.62-mm (0.3-in) or 5.56-in (0.219-in) ball cartridges, but the spigot will accept only one or the other. If required they can be fired from conventional rifle launchers. The grenades used with the AP/AV700 have hollow-charge warheads that can penetrate up to 120 mm (4.72 in) of armour, but they also have a considerable blast and anti-personnel effect. The three-spigot launcher can be used to fire the grenades one at a time or in one salvo for greater effect. It is possible to fire six or seven salvoes per minute. Although the main offensive grenade has a hollow-charge warhead, other types that will eventually be available include illuminating, smoke and practice.

The AP/AV700 is still under development but is now at the stage where production is imminent. When it does reach service several applications are possible. It could be used in the place of orthodox light mortars by infantry units, and could also be mounted on light armoured or soft-skin vehicles. It could also be used on light patrol or landing craft, and applications at outlying or guard blockhouses can be foreseen, especially where pre-plotted ranges have been logged for use when required. The launcher can be carried on a special backpack, with another carrying the grenades.

Specification

AP/AV700
Length: spigots 0.3 m (11.81 in)
Weights: launcher 11 kg (24.25 lb); grenade 0.93 kg (2.05 lb); grenade warhead 0.46 kg (1.01 lb)
Maximum range: 700 m (765 yards)

USSR

AGS-17 Plamya

The 30-mm (1.18-in) **AGS-17 Plamya** (flame) is an automatic grenade-launcher that first appeared in 1975 and is now issued widely throughout the Soviet armed forces down to company level. At that level it is usually issued at the rate of two to each infantry company, and is one of the main company support weapons for the assault phase of an operation. When it first appeared the AGS-17 caused quite a stir in Western weapon design circles, for at that time there was no Western equivalent, although one has appeared since.

The AGS-17 fires small HE grenades at a rate of just one a second. The grenades are fed into the weapon from a 29-round belt, usually using a belt drum that is prominent on the right-hand side of the weapon. When firing, the AGS-17 is mounted on a tripod and can be aimed using a dial sight at the rear of the weapon body. The operating system is simple blowback, part of the action operating a pawl mechanism to move the ammunition belt. Firing can be either direct, or high angle to provide more range.

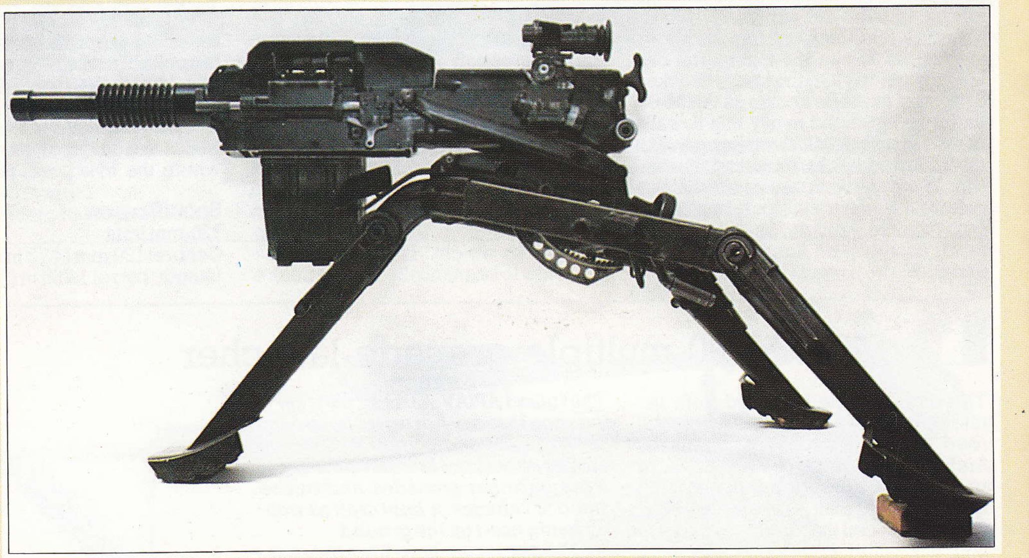
The AGS-17 has been used in action in Afghanistan, from where much of the information regarding the weapon has emanated. It has been used not only on its tripod mounting but on special helicopter mounts, and there appears to be some evidence that the AGS-17 has taken the place of the main gun on some Soviet armoured personnel carriers and reconnaissance vehicles such as the BMD. In Afghanistan the AGS-17 has been used widely for fire suppression during anti-guerrilla operations. Among the guerrillas it has earned a reputation for nastiness, largely because the grenades detonate with a fearful blast. But what has impressed Western observers is the weapon's range, which can be as much as 1750 m (1,914 yards), although operationally it is not often used at ranges greater than 1200 m (1,312 yards). This means that the weapon has a much higher potential for fire response than a mortar, and its automatic rate of fire can soon compensate for the small projectile payload. In a conventional attack this fire could be directed rapidly at defending posts, and as the grenade is an area weapon rather than a point weapon it can make an enemy keep his head down during the critical attack phases. The main drawback to the AGS-17 appears to be its weight, for the launcher and tripod together weigh more than 53 kg (117 lb), which means it has to have a crew of at least two men and probably more to carry extra ammunition.

Specification

AGS-17
Calibre: 30 mm (1.18 in)
Length: 0.84 m (33 in)
Weights: launcher about 18 kg (39.7 lb); tripod about 35 kg (77.2 lb); grenade 0.35 kg (0.77 lb)
Maximum range: 1750 m (1,914 yards)

‘Flame’ in Afghanistan

The Soviet intervention in Afghanistan has seen much in the way of innovation in weaponry. One system which came to prominence was the AGS-17 automatic grenade launcher, which proved extremely potent. Yet far from being a new weapon, the AGS-17 was in widespread Soviet service, and had been since 1975.



While not a lightweight weapon, the AGS-17 weighs considerably less than a heavy-calibre machine-gun, and widespread issue throughout the Soviet army has provided real firepower at company level.

The AGS-17 (*Automaticheskiy Granatmyot Stankoviy*, or tripod-mounted automatic grenade-launcher) is known to the Soviet soldiers who use it as the Plamya (flame). The Afghan guerrillas have learned the name, and apply it to what they believe to be the most dangerous weapon they face from the Soviet riflemen. Since its introduction in 1975, the AGS-17 has given Soviet motorized rifle companies a capability of effective long-range area fire.

Soviet tactics

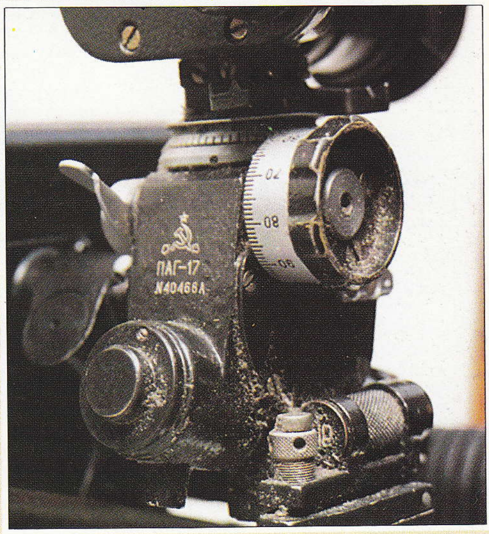
The AGS-17 is a company-level weapon. A section of two AGS-17s was first added to BTR-60Pb-equipped motorized rifle companies in high-readiness divisions. By 1981 BMP-equipped motorized rifle companies also had AGS-17 sections. Each section is made up of a sergeant section-leader, armed with a Kalashnikov assault rifle, and the two gun teams, each of a pistol-armed gunner who carries the AGS-17 sight and tube, a Kalashnikov-armed assistant gunner who carries the tripod and ammunition, and a Kalashnikov-armed ammunition bearer. The ammunition bearers are not integral parts of the AGS-17 section, but rather are provided from the rest of the motorized rifle company.

In action, an AGS-17 section tries to deploy dismounted and under cover. To provide the grenades with sufficient clearance, the teams deploy a distance to the rear of the cover greater than twice the cover's height. The two launchers will normally be placed in a line, 10 to 20 m (33 to 66 ft) apart. The ammunition bearers provide close-range security with their Kalashnikovs.

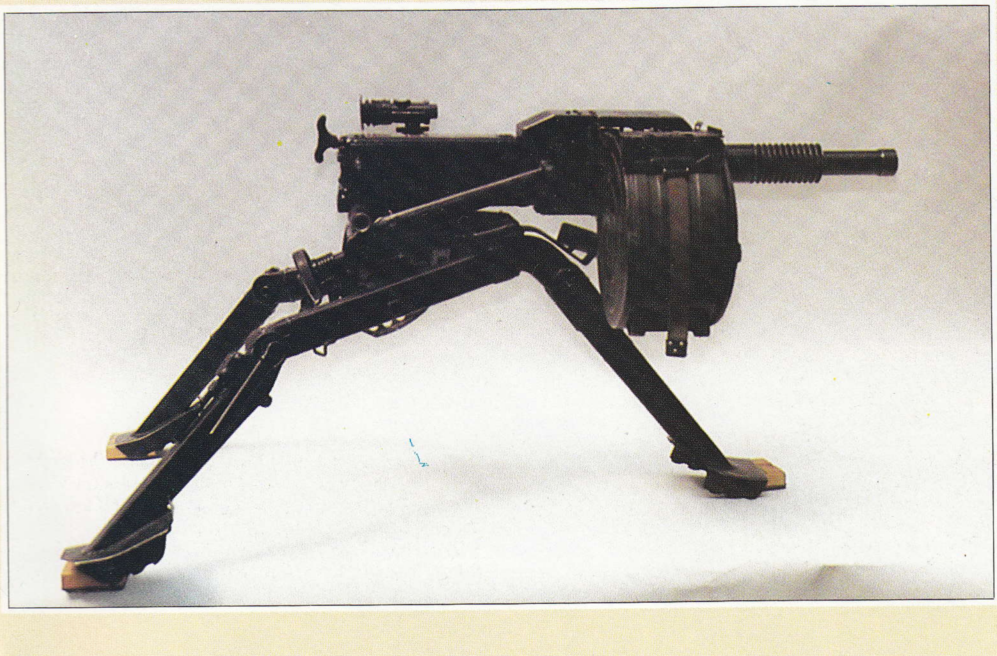
AGS-17 sections are used as the base of fire as part of the company's mounted or dismounted advance. Because they can also be easily lifted in a helicopter, AGS-17s are often used, according to Afghan reports, in the commando-style heliborne attacks that have in 1984-5 become increasingly prevalent throughout Afghanistan. The Soviets put round a village a cordon inserted by helicopter, deploy AGS-17s in cover, then move in. If they encounter resistance the AGS-17s provide supporting fire. Thus, while not a light weapon, the AGS-17 is frequently used as part of forces undertaking heliborne assaults or extended dismounted operations, both required for effective counter-insurgency tactics in the Afghan mountains.

In Afghanistan, Soviet units have been upgunned with additional AGS-17s. In some cases it appears that the sections have been doubled in size. They are also used in conjunction with battalion-level 82-mm (3.23-in) AM Vasilek automatic mortars, which also provide mobile, responsive, and decentralized HE firepower to support Soviet riflemen. The AGS-17's VOF-2 grenades can demolish the *sangars* (rock breastworks) from behind which the Afghans engage Soviet troops. Their high elevation makes them useful against high ground. Its fragmentation shells give the AGS-17 an effective area fire-suppression capability, especially deadly against fighting positions lacking overhead cover.

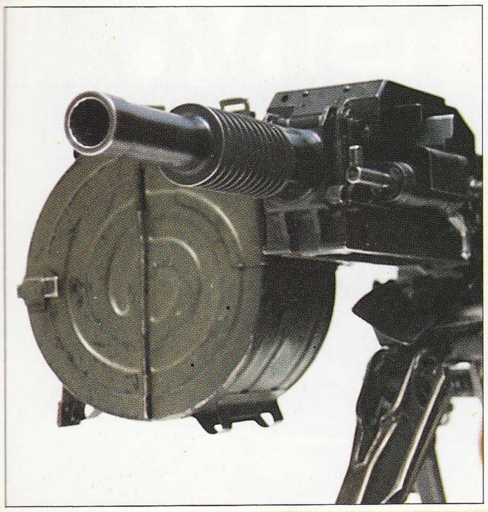
The AGS-17 has become important in Afghanistan because of the long range of many of the firefights. The 5.45-mm (0.215-in) AKS-74 assault rifle, with which most Soviet motorized

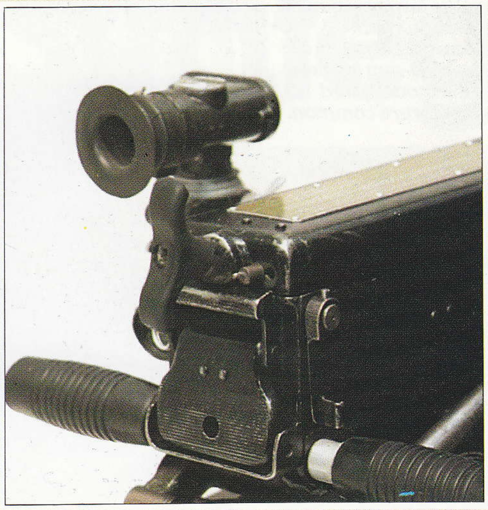


Above: The fairly complex optical sight is necessary on a weapon with a potential range of 1750 m (1,914 yards), although firing beyond 1200 m (1,312 yards) seldom occurred operationally.



Left: The AGS-17 operates by blowback, the propellant forcing the bolt back while shooting the grenade through the barrel.





Two views of the AGS-17 show the 30-mm barrel surrounded by cooling fins together with the 30-round drum magazine, and the eyepiece of the sight, the hand grips and the trigger (the grooved plate between the grips), which is pressed inwards to fire.

riflemen are armed, has a maximum effective range of only 400 m (437 yards). The 7.62-mm (0.3-in) PKM general purpose machine-gun (each squad has one or two) would splatter its fire on the *sangars* without harming the Afghans behind them. Snipers (one per platoon, armed with a 7.62-mm SVD Dragunov rifle) have proved of only limited effectiveness, and the Soviets had to mass them in dedicated anti-sniper squads. By default, the AGS-17 (able to elevate to hit hilltops, able to demolish *sangars*, and able to be carried anywhere a rifleman can walk or be inserted by helicopter) has assumed additional importance.

The Soviets also use AGS-17s, well entrenched, to defend high-value objectives. They are deployed as part of company strongpoints, or in perimeter defences. In 1982, Ahmad Shah Massoud's guerrilla forces in the Panjshir valley were confronted by the defences of the town of Rukha, a Soviet strongpoint that included four AGS-17s. Realizing that the AGS-17s were the key to Soviet defence of this most important strongpoint, Massoud organized an attack reminiscent of North Vietnamese tactics (breaching the defensive wire and minefields, then attacking at night into the perimeter) but which was alien to the usual Afghan style of hit-and-run attacks. Casualties were heavy on both sides, but as the Afghans withdrew before dawn and the helicopters arrived, they had captured or destroyed the four AGS-17s. After Massoud's attack had penetrated the position, the Soviets realized that Rukha could not be defended and withdrew their garrison.

Several AGS-17s have come out of Afghanistan and been delivered to Western intelligence services. In Angola, South African forces have captured a number of AGS-17s in the hands of SWAPO and Angolan army forces. The Afghans have also captured several AGS-17s, some of which have been used in action against their former owners. Shafiuallah, the well-known guerrilla commander in the Koh-i-Safi area near Bagram air base until he was killed in action in April 1985, had at least six operational AGS-17s.

There are limitations, however, to the use the guerrillas make of captured AGS-17s. It was not used by the pre-war Afghan army, unlike other Soviet-built weapons, and so the cadre of ex-soldiers on whom the guerrillas rely for much of their weapons expertise cannot provide help on their use and maintenance. The Afghans also reported that the tripod is inadequate for the recoil of the weapon, and moves around if not properly secured with sandbags. This would certainly increase ballistic dispersion, already high because of the nature of the weapon. It is also thought that the design of the feed mechanism of the AGS-17 is flawed in that it is possible that a stubbed round resulting from a misfeed could lead to a premature detonation, although there have been no known reports of such detonations.

The weapon

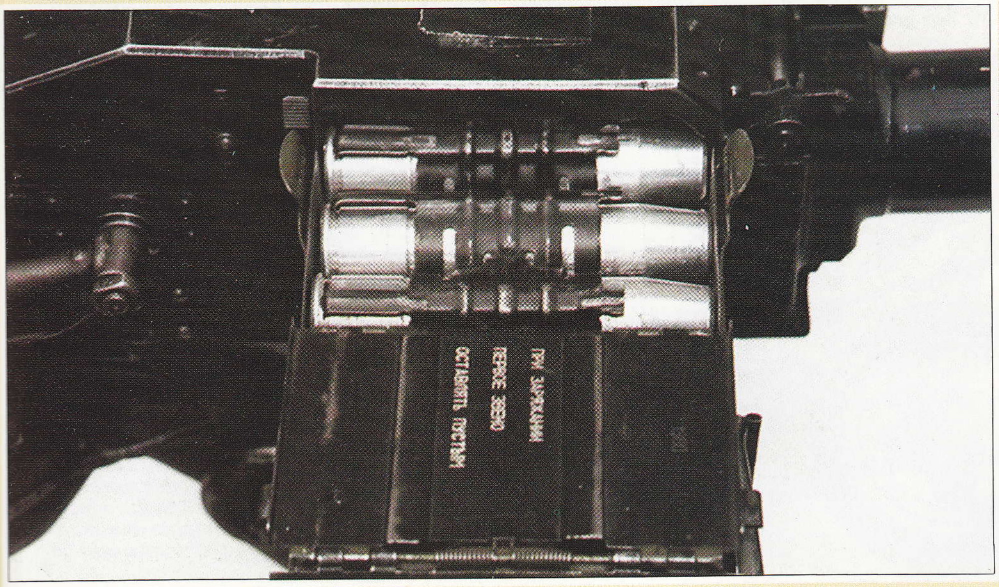
AGS-17s have been used in a number of ways. The AGS-17 has a short barrel and large rectangular receiver with a circular magazine feeding into its right side. There is a small optical sight and an elevation quadrant on the left rear of the weapon. The AGS-17 is normally mounted on a light, low tripod.

The standard VOF-2 30-mm HE fragmentation grenade uses Soviet A-IX-1 explosive, a compound of 94 per cent RDX and 6 per cent wax. Also reported is a beehive round, functioning as a massive shotgun round loaded with steel flechettes (small, arrow-like projectiles). Other ammunition types include an incendiary round, a training round and possibly a HEAT round.

The standard vehicle mount for the AGS-17 is external. The weapon is attached to the turret tops of BTR-60Pb and BTR-70 APCs and BMP infantry fighting vehicles, and can be aimed and fired from under armour, although apparently it must be reloaded by a crew member opening the hatch; a dangerous procedure when opposing an enemy armed with 7.7-mm (0.303-in) Lee Enfields and capable of sniping Soviet soldiers 730 m (800 yards) away. Externally mounted AGS-17s would be particularly useful on the 73-mm (2.87-in) cannon-armed BMP, whose main armament is limited in elevation, a drawback in mountainous Afghanistan.

Some photographs from Afghanistan show BMD airborne infantry combat vehicles with what may be an AGS-17 mounted in place of its 2A20 73-mm cannon, the sort of field modification that has ample precedents in US practice in Vietnam. There are also unconfirmed reports of BTR-60Pb APCs with long-barrelled versions of the AGS-17 in their turret in place of the usual 14.5-mm (0.57-in) heavy machine-gun.

A long-barrelled version of the AGS-17 is mounted on Soviet Mil Mi-8 'Hip-E' attack helicopters in Afghanistan. Its characteristics would make it an excellent weapon for helicopter use, similar to the 40-mm grenade-launching system on many American Bell AH-1 Cobra gunships. The ballistic dispersal of the AGS-17 makes it basically an area fire weapon, and with the ammunition supply that could be carried on a helicopter it could suppress sizeable areas, probably to prepare landing zones for heliborne assaults. This weapon does not, however, appear to be particularly widespread and its use may be limited to a few squadrons. At least one 'Hip-E' armed with a 30-mm grenade-launcher has been shot down in eastern Afghanistan.

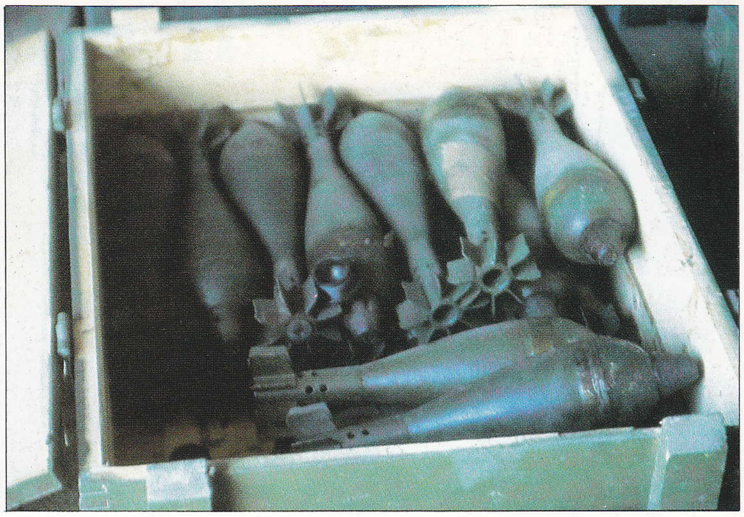


Ammunition is fed into the AGS-17 from the right. Amongst the types so far known to have been used, HE and flechette are prominent, although an incendiary round is likely, and it would be surprising if the version mounted on the BMD infantry combat vehicle were not capable of firing HEAT.

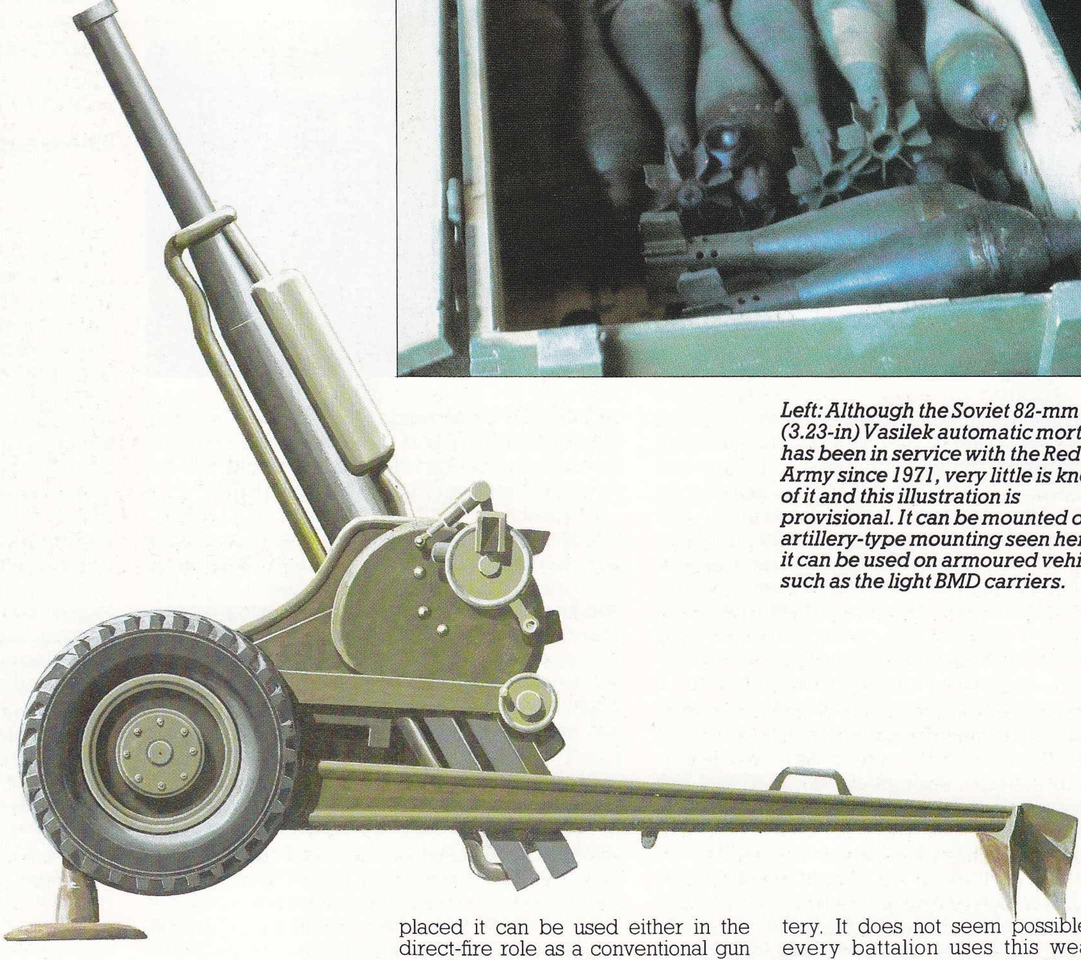
USSR

Soviet mortars

The Soviet army has used a large number of mortar types over the years, and the surprising thing is that many of them dating from before World War II are still in widespread service. These mortars range in calibre from 50 mm (1.97 in) to 160 mm (6.3 in) via 82 mm (3.23 in), 107 mm (4.21 in) and 120 mm (4.72 in). All these calibres are standard throughout the Warsaw Pact nations, but the 120-mm calibre is now the most widely used. The Soviets produced one of the finest of all World War II mortars with their **Model 1938** and the **Model 1943** derived from it, and both of these have been widely copied over the years; many modern 120-mm mortars owe much to both weapons. The large 160-mm weapons are used by Soviet army divisional support batteries instead of conventional artillery: they are breech-loaded weapons of great length and weight, and the latest model is known as the **M-160**.



Right: Amongst the large amount of Soviet-supplied equipment uncovered by American troops on Grenada, crates of 82-mm Model 0-832 rounds for the modernized Model 1937 mortar were common.



Left: Although the Soviet 82-mm (3.23-in) Vasilek automatic mortar has been in service with the Red Army since 1971, very little is known of it and this illustration is provisional. It can be mounted on the artillery-type mounting seen here, or it can be used on armoured vehicles such as the light BMD carriers.

There is an oddity among these Soviet mortars, a weapon known as the **Avtomaticheskiy Minomet Vasilek** (Little Vasili automatic mortar). This is still something of a mystery, for although it was introduced into Soviet army service as far back as 1971 few illustrations and even less data have been released concerning it specification or tactical use. It is known that its calibre is 82 mm, and that one version uses a mountain gun carriage that can be towed by a light vehicle. Once emplaced it can be used either in the direct-fire role as a conventional gun or in the high-angle-fire mortar role. In action the carriage wheels are raised off the ground and the weapon rests on a firing baseplate. It is not yet known exactly how the ammunition is fed into the weapon but some form of clip or belt feed can be surmised. It is known that HE fragmentation rounds and hollow-charge rounds can be fired, the latter against armoured targets.

There are also several versions of the Vasilek that can be mounted on light armoured vehicles, usually in some form of turret. Each Soviet army infantry battalion, mechanized or otherwise, should have a Vasilek battery. It does not seem possible that every battalion uses this weapon, however, and only front-line battalions are known to be equipped. A Vasilek battery has six weapons.

The old World War II 50-mm mortars are now very little used by the Warsaw Pact nations, but may be encountered in use by other armed forces, especially 'freedom fighter' formations. The only 81-mm mortar still in widespread use is an updated version of the **Model 1937**, while the 107-mm **Model 1938** is now used by a few Soviet army mountain units and some reserve units. However, the 120-mm Model 1938 and Model 1943 are still in widespread use, and the Model 1943 is still being produced in China as the **Type 53**.

Specification

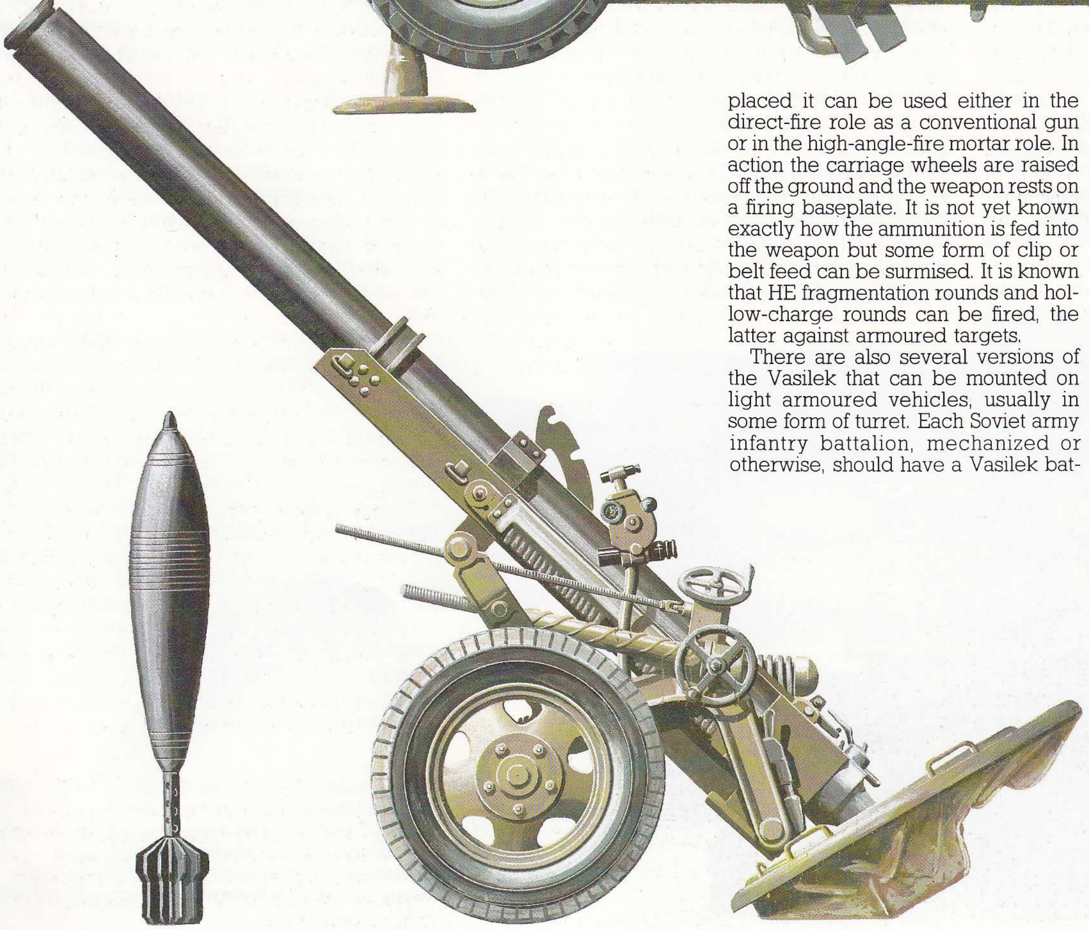
Model 1943

Calibre: 120 mm (4.72 in)

Length: barrel 1.854 m (73 in)

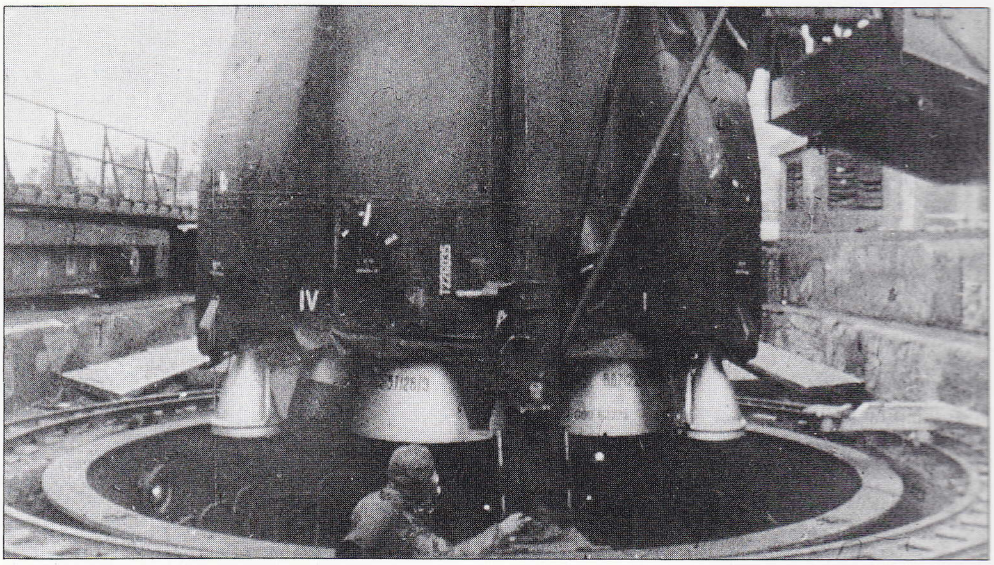
Weights: in action 275 kg (606.3 lb); HE fragmentation bomb 16 kg (35.27 lb)

Maximum range: 5700 m (6,233 yards)



Left: The large Soviet 160-mm (6.3-in) Model 1943 mortar is a breech-loaded weapon and is often used in lieu of artillery to supply fire support to infantry units at divisional level. The bomb fired by this mortar weighs 40.8 kg (89.95 lb), which makes it a formidable weapon at the short ranges at which it has to be used.

Soviet Strategic Rocket Forces



The USSR currently deploys nearly 1,400 silo launchers, each with one missile and an unknown number of re-loads. Here an SS-9 ICBM is loaded into its silo during the late 1960s. The SS-9 bases were hardened in the 1970s to increase survivability before SS-18s were installed.

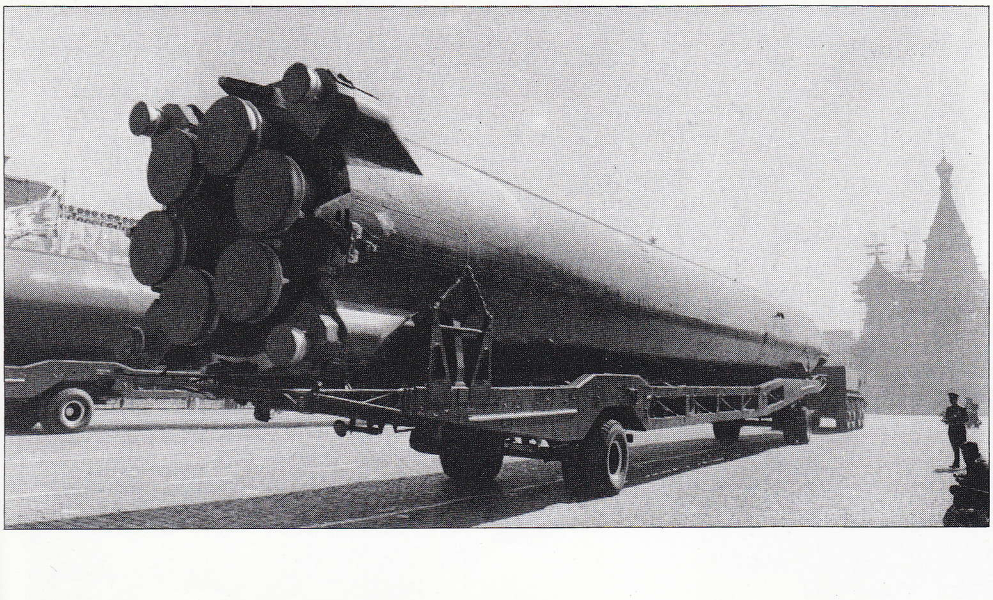
In wartime the Strategic Rocket Forces (SRF) operate independently of the Soviets' other armed services, the SRF's commander-in-chief being subordinated directly to the Soviet supreme commander, who reports to the Defence Council which makes the final decision on the mass use of the nuclear weapons. The SRF's commander is responsible not only for the operational control of the force in war and peace, but also for its improvement and development and for ensuring that it is up to strength and properly equipped at all times.

The SRF was established as an independent service in December 1959. With an active manpower total of 415,000 and a further 520,000 in reserve, the SRF's commander has under his control three Rocket Armies with intercontinental ballistic missiles (ICBMs), three independent Rocket Corps, 10 to 12 Rocket Divisions, three large missile test ranges, and a substantial number of scientific research, missile construction and training establishments.

The basic rocket army consists of 10 Rocket Divisions. Each of these divisions comprises 7,000 to 8,000 men, and is subdivided into 10 Rocket Regiments and a technical base, the latter consisting of some 3,000 to 4,000 men and designed to carry out the transport, maintenance, replacement, repair and servicing of the regiment's missiles. The regiment itself can have between one and 10 launchers depending upon the type of missile with which it is equipped. Its strength lies between 250 and 400 men, and the regiment is tasked with simple maintenance of the missiles, defending them in their silos and launching them as and when required. For these duties the regimental commander has available a headquarters staff, about five duty launch teams which are rotated on either weekly, or in some circumstances, monthly bases, an emergency missile repair battery, and a guard company which uses some 50 guard dogs, extensive anti-personnel minefields and barbed-wire obstacles. The commander and his staff are located in a hardened underground command post from which the duty operations team maintains direct communications links by telephone, radio and satellite with the divisional commander, the rocket army commander, the SRF commander and the Soviet supreme command authority. If by accident the command post is put out of action in times of peace, an alternative vehicle-mounted mobile command post unit is activated; in time of war or in periods of extreme tension, both units are operational to ensure that missile launch control is available at all times. The headquarters of the army is responsible for the co-ordination of its divisions and has the capability (through the use of flying command posts) to direct the launching of missiles from regiments and divisions whose command facilities have been destroyed. The area of deployment of a rocket army is very large, and takes in thousands of square miles of usually poorly populated land.

The 10 or 12 separate rocket divisions form the operational strategic reserve of the SRF. Some of these divisions are equipped with the highest-yield missiles in the Soviet inventory, whilst others have standard missile types and can be moved as needed to any part of the Soviet homeland in order to reduce their vulnerability. The three independent rocket corps are used to strengthen the forces of the three main military commands (the Western, South Western and Far Eastern Directions) and are at the disposal of the relevant commanders-in-chief. A whole corps (or just some of its three to four available rocket divisions), can be used in support of the advancing units in any of the Directions' theatres of operation. The corps are equipped with the operational/strategic type of missile which falls into the medium-range ballistic missile (MRBM) and intermediate-range ballistic missile (IRBM) categories in Western terminology. These weapons can either be fired from a hardened silo (or fixed soft launch pad in the case of the former SS-4 'Sandal') or be launched from wheeled transporter-erector-launchers (TELs) in the case of the mobile SS-20 IRBM.

The SS-20 force is grouped into regiments of nine TELs that are situated at a central control and maintenance base. In times of imminent conflict the individual launchers are intended to disperse to widely spaced and presurveyed launch sites to ensure survivability and the minimum error in the inertial guidance data fed into each missile. Three other wheeled vehicles would also be present, one carrying a reload round and the others containing the launch control unit, test equipment, generators and communications systems. In the last year or so, it has been revealed that some of the SS-20 bases



A third-generation missile, the SS-9 'Scarp', appeared in five variants, one of which, the SS-9 Mod 4, was the first Soviet multiple re-entry vehicle (MRV), carrying three 3.5-megaton unguided warheads. Nearly 300 SS-9s were deployed in underground silos.

have been converted to house the new mobile SS-25 ICBM, which uses the same TEL vehicle. It is likely that these missiles are assigned to the SRF's operational reserve as a replacement for more vulnerable systems.

There are at present nine fields of the hot-launched SS-11 'Sego' lightweight ICBM with 520 missiles, one field of the SS-13 'Savage' hot-launched lightweight ICBM with 60 rounds, two fields of the cold-launched SS-17 lightweight ICBM with 150 rounds, six fields of the cold-launched heavyweight SS-18 ICBM with 308 rounds, and four fields of the hot-launched lightweight SS-19 ICBM. The SRF continually practises its command and control launch arrangements under all types of scenarios, and has a policy whereby a missile is periodically taken on a random basis from any of the rocket armies to be launched under 'operational' conditions to check the forces' effectiveness.

For a protracted nuclear war the Soviets have made certain that their SRF has sufficient war reserves, protection for its personnel and key equipment, and the facility to reload most of its launchers. They have stockpiled extra missiles, propellants and warheads throughout the USSR, and can thus refurbish and reload most types of missile silo within a matter of days. For the contingency that a silo has been contaminated by radioactive material from a nuclear burst, facilities have been built in each ICBM field to allow decontamination to be undertaken. All communications systems throughout the SRF are hardened against the electro-magnetic pulse effect from nuclear blasts, and are duplicated (or even triplicated in some instances) to ensure that command and control capability remains intact.

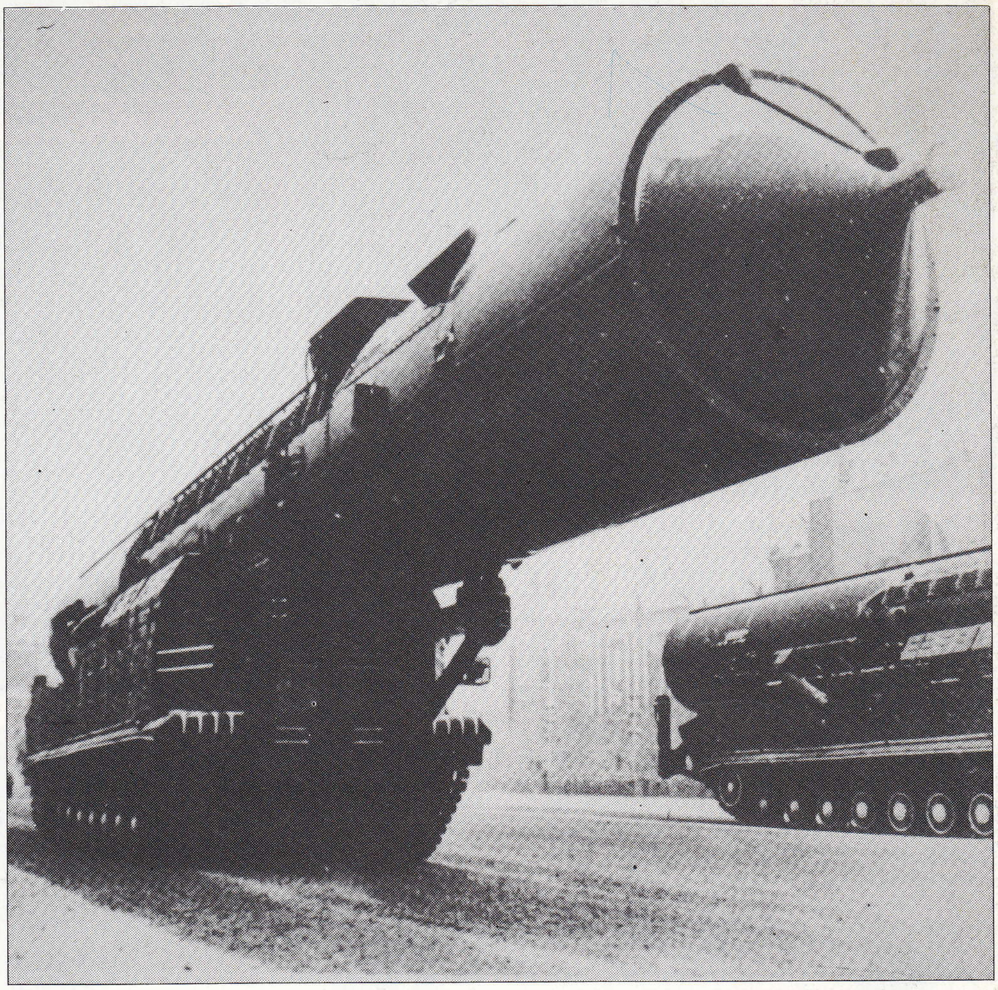
Intelligence of any possible Western nuclear surprise attack is provided not only by human agents but also by a satellite-based ICBM/SLBM launch-detection network coupled to a ring of missile launch-detection over-the-horizon and phased-array radar installations throughout the USSR. Any offensive action undertaken by the SRF would be coordinated with the Soviet navy's SSBN fleet and the strategic bombers of the USSR's air forces. It is also possible that in a limited nuclear exchange, a number of the ICBMs would very likely be used in theatre roles against reduced-range targets. It is also probable that a number of the ICBM fields may be protected by a limited anti-ballistic missile (ABM) network comprising SA-5 'Gammon' and the later SA-12 'Gladiator' SAMs.

The current force of ICBMs stands at 1,398 silo launchers with one missile in each, plus an unknown number of reloads and mobile SS-25 TELs. The actual breakdown is believed to be:

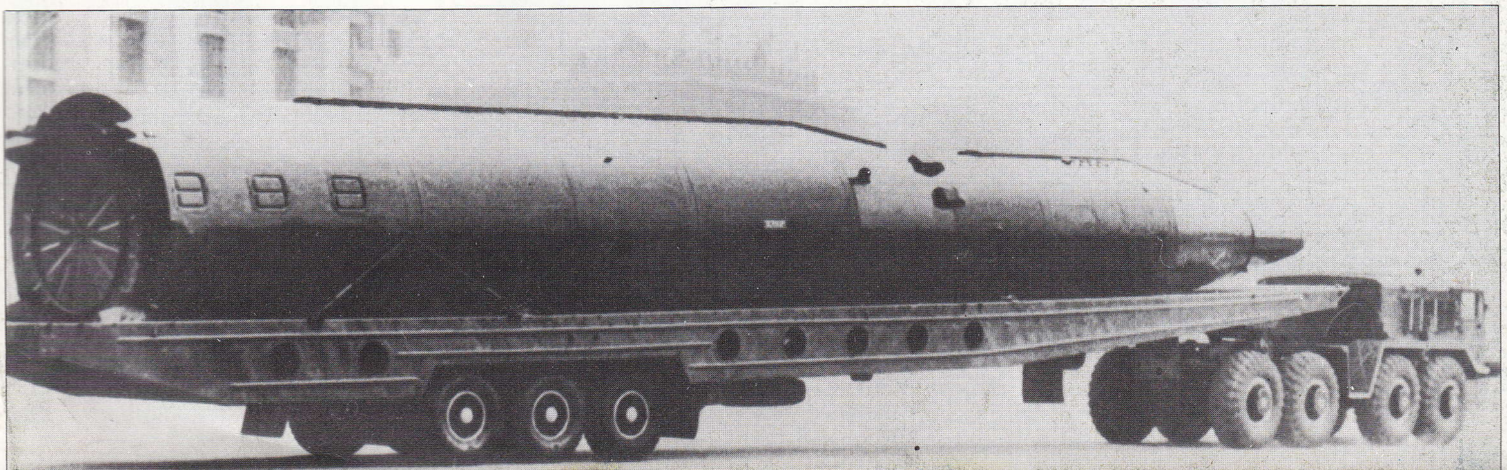
1. 520 SS-11 'Segos' (100 Mod 1 with a range of 8800 km/5,468 miles and a single 950-kiloton warhead, and 420 Mod 3 with a range of 9600/5,965 miles and three 200-kiloton MRV warheads);
2. 60 SS-13 'Savages' (all Mod 2 with a range of 8000 km/4,970 miles and a single 600-kiloton warhead);
3. 150 SS-17s (20 Mod 2 with a range of 11000 km/6,835 miles and a single 6-megaton warhead, and 130 Mod 3 with a range of 10000 km/6,214 miles and four 750-kiloton yield MIRV warheads);
4. 308 SS-18s (26 Mods 1 and 3 with a range of 12000 km/7,456 miles or 16000 km/9,942 miles and a single 20-megaton or 27-megaton warhead respectively and 282 Mod 4 with a range of 11000 km/6,835 miles and 10 500-kiloton MIRV warheads); and
5. 360 SS-19s (40 Mod 2 with a range of 10000 km/6,214 miles and a single 10-megaton warhead and 320 Mod 3 with a range of 10000 km/6,214 miles and six 550-kiloton MIRV warheads).

The force of operational strategic missiles stands at over 600 rounds with a breakdown of:

1. 387 SS-20 mobile launchers in six fields located in the Soviet Far East, in central Asia, and in the western USSR on the European side of the Ural mountains; more are scheduled to be deployed in the next year or so; the SS-20 is used in the version with 5000-km (3,107-mile) range and three 150-kiloton MIRV warheads; and
2. Some 224 2200-km (1,367-mile) range SS-4 'Sandal' MRBMs with single 950-kiloton warheads deployed in two or three fields of hardened silos and soft launch pads in the western USSR; the 'Sandals' are gradually being phased out.



Precursor of the SS-16 and SS-20 mobile IRBMs was the SS-X-15, which was tested during the late 1960s but not deployed for operational service. Mobile ballistic missiles are easier to conceal from surveillance: a great advantage to a power engaged in disarmament negotiations.



First seen on parade in 1968, the second-generation SS-8 'Sasin' was a development of the SS-6 and was guided by radio command. Carrying a 6-megaton warhead, it had two stages and a range of 12000 km (7,400 miles) but was deployed only in small numbers.